ELECTRICAL REVIEW

FOUNDED 1872

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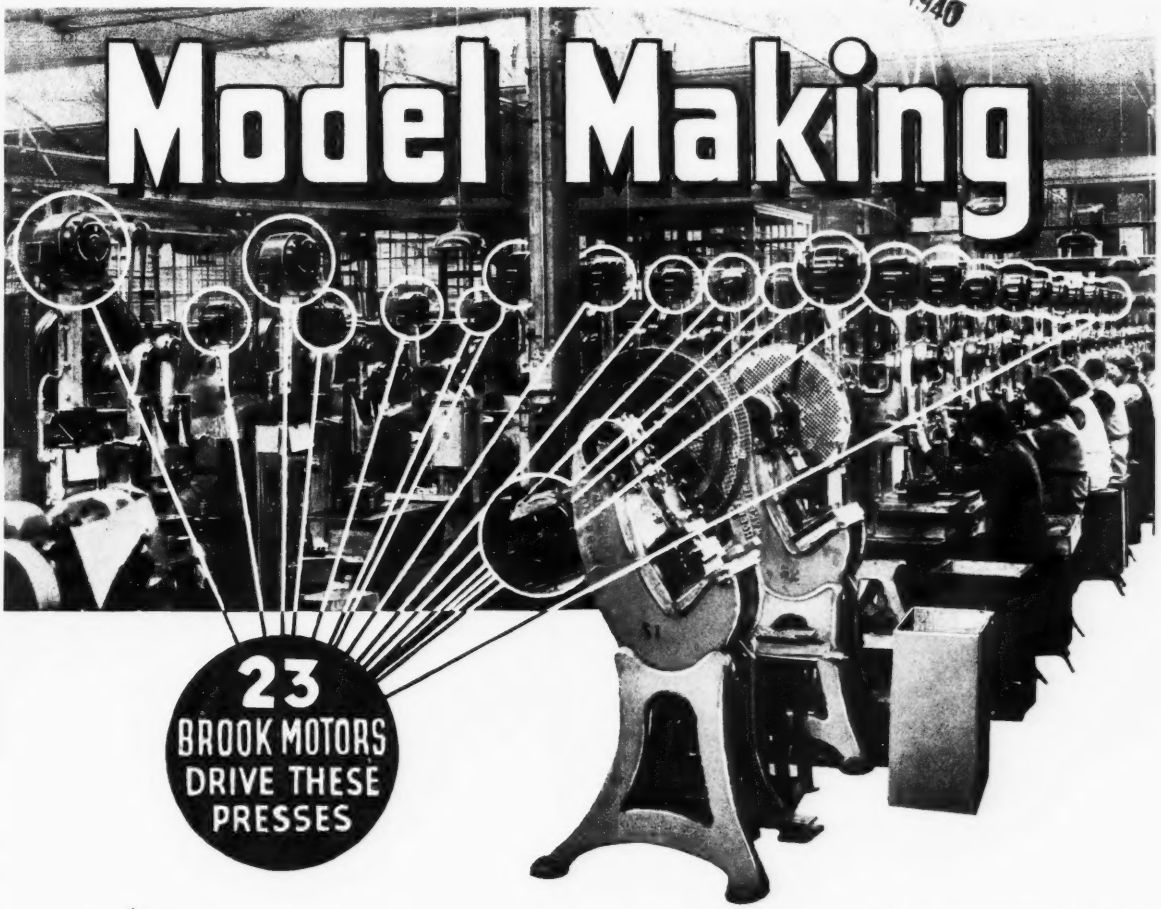
Model Making



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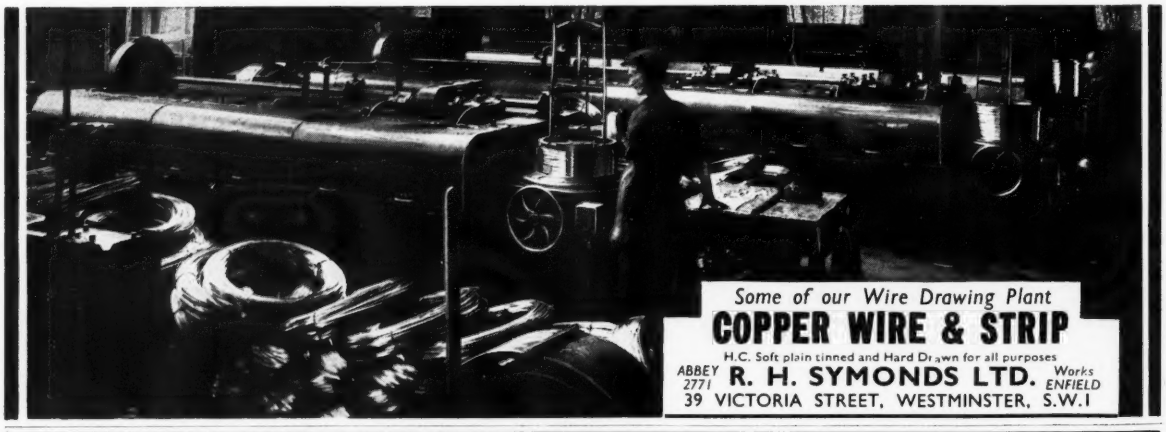
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THE ELECTRICAL REVIEW

Volume CXXVIII — No. 3286

Friday, November 15th, 1940

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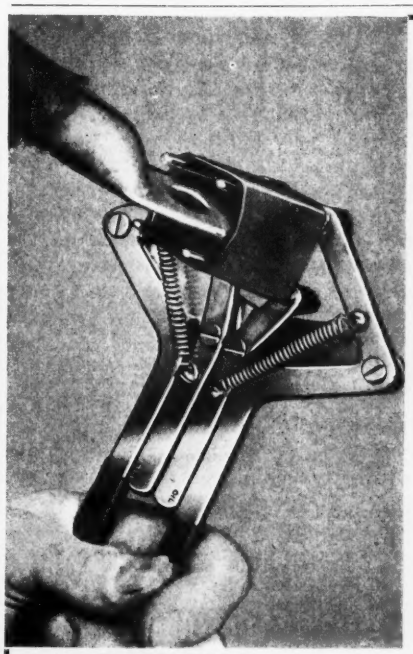

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THE
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3286 NOVEMBER 15, 1940 Price SIXPENCE

Dual-Purpose Propaganda

E.D.A. Helps Nation and Industry

EARLY this year we were able to give readers an assurance that the British Electrical Development Association, far from being a war casualty as many thought it might be, was continuing to show great vigour in the cause for which it was established. Since that time the happenings in Europe and elsewhere have put a different complexion on most of our affairs and naturally E.D.A. has not escaped.

While the Association has not lost sight of its original purpose, the expansion of the use of electricity, other matters have arisen which have tended to make this a secondary consideration. The major part of its work is now related to the successful prosecution of the war and is manifest in a number of directions. These activities are somewhat less spectacular than the normal work, but they are no less effective. The industry should not, for instance, judge the Association by the amount of its advertising. War restrictions and the understanding arrived at with the gas industry have combined to reduce national advertising, but the funds have been redirected into other fruitful channels and the effect will be felt in due course.

Helping the Government

The most important aspect of E.D.A.'s wartime work is its position as a link between the electricity supply industry and Government Departments. On the more popular side, its participation in the National Food Campaign has been the most noteworthy activity. All over the country cookery demonstrations have been arranged and for this purpose a useful little handbook has been produced for electrical demonstrators containing a varied selection of wartime recipes based upon the employment of home-grown foods. In this connection the Association was successful in securing an increased allowance of rationed commodities for demonstration purposes.

The Ministry of Food produced some quite good charts to encourage properly balanced diets. E.D.A. went one better and prepared three posters which pushed home the idea even more effectively. These have received the approval of the Ministry and will largely replace the original diagrams and incidentally bring E.D.A.'s name prominently before the public. In addition to this, conferences of domestic science teachers and others have been arranged and information on fruit and vegetable drying has been made available in conjunction with the Ministry.

Another Department with which there has been a great deal of co-operation is the Ministry of Information. Readers are now familiar with the special window displays drawing attention to various phases of our war effort—the Royal Air Force, the Merchant Navy and so forth. It may be news to them, however, that E.D.A. has been responsible for the distribution of over half of these displays and has thus aided the cause of the nation and electricity at one and the same time.

New Films

Two films have been produced and presented by the Association to the same Ministry to form part of its cinema programmes for private showing: one aims at increasing milk consumption and the other inculcates the idea of "wise feeding." They both represent indirect electrical propaganda. A new film dealing with national health has also been produced for early showing.

In co-operation with the Electric Lamp Manufacturers' Association, a great deal of attention has been given to factory lighting and 30,000 copies of the practical handbook "Modern Factory Lighting" have been circulated. This has had considerable influence and the Ministry of Supply has asked the Association to produce a new edition. Secretarial and other help is being provided in connection with the National Industrial Lighting Service.

For the Ministry of Home Security E.D.A. has circulated some useful notes on electricity for air-raid wardens and the Ministry has had the Association's advice and assistance in such matters as shelter warming, siren heating (to prevent freezing up) and "starlighting." The Association is endeavouring to convince the Ministry of the necessity for shelter heating which has already been installed by a number of local authorities.

So far as the War Office is concerned, E.D.A. has dealt with the supply of electricity for cooking and heating in camps and billets, and in conjunction with the Office of Works and the R.A.F. has almost persuaded them to put specifications for heavy electrical equipment on the same footing as coal appliances. The subject of fuel economy has been taken up with the Mines Department and the Association has helped to secure for cooker manufacturers a steel ration of 20 per cent. of their normal consumption. These activities have all been carried out by a reduced staff (and with a reduced income) and yet ordinary development activity is still proceeding to a remarkable extent. Sales of publicity matter, for instance, so far this year have been between 40 and 50 per cent. of normal and the demand for window displays has actually been greater. The circulation of "Electrical Housekeeping" remains at about 80 per cent. of the peacetime figure and the E.D.A. films are still being hired. This is by no means a complete story, but we have said enough to indicate that E.D.A. has more than justified its existence in wartime. Members can be sure that their money is being well spent; in fact it is an excellent investment whether regarded from the national standpoint or that of the industry.

Earth Electrodes

VIEWS on the most effective means of obtaining a low-resistance connection with earth have been modified during the past ten years or so, largely as a result of the work of the E.R.A. Buried earth plates have been generally superseded by earth rods and the latter can be of smaller diameter than was once regarded as necessary. On many sites, especially where permanent moisture exists some way below the surface, depth of penetration gives greater electrode efficiency (measured in conductance per unit length) than does the use of several relatively short electrodes in parallel. The difficulties of dealing with lengths in excess of, say, 8 ft. appear to have been overcome by the use of short coupled rods driven by electric hammers. The coupling of these rods is a matter of considerable importance and in this issue Dr. H. G. Taylor discusses methods that enable intimate contact with the soil to be preserved through the whole of their depth.

Compulsory Observance

IT will be recalled that the Conditions of Employment and National Arbitration Order made by the Minister of Labour two or three months ago stipulated that employers in any industry must observe the decisions of a properly established body regarding wages and conditions in that industry. Recently the Faversham Town Council refused to pay a wage increase decided upon by the N.J.I.C. for the Electricity Supply Industry upon which it is not represented. The Town Clerk has pointed out, however, that in view of the Order the Council is acting *ultra vires* and so it has had to rescind its previous decision and is to pay the increased rate. At the same time the Association of Municipal Corporations is being asked if the Order is considered to be binding upon a Council which is not a party to the various bodies dealing with wages and conditions of employment. The Association's reply will be awaited with some interest, but in our opinion the Order was made for just this purpose—to bring about industrial harmony by compelling unwilling employers to conform to the decisions of properly-constituted and representative bodies which have worked out fair wages and conditions for their respective industries.

Factory Lighting

COMMENTING on the projected minimum lighting standards for factories in Great Britain, *Electrical News & Engineering* (Toronto) draws attention to a difficulty that generally accompanies the imposition of a compulsory minimum. Such a minimum is usually low in order that all types of establishments may meet the requirements without too great inconvenience. Once the figure has been prescribed, the danger is that those responsible for conforming with the law may not be inclined to do better. In other words the minimum tends to become the maximum. We doubt whether this applies to illumination to anything like the same extent as it does in most instances. The standards proposed are far higher than the worst and will do much towards reducing strain on the workers. Moreover, it has been so unmistakably demonstrated that good lighting pays for itself in increased output, that a general habit of requiring higher standards in that direction is likely to be set up, as is evident in many of the factories which have recently been established. Still, the risk mentioned is one to be borne in mind and the efforts in education and propaganda to prove the economy of properly designed lighting systems should not be relaxed.

Substation Fires

IN an important section of the Report of the Fire Risks Investigation Committee (1938), supply undertakings were urged to keep closely in touch with the local fire brigades with regard to arrangements for fire-fighting at generating stations and main substations. War risks emphasise the need for such collaboration and even for its extension to factories, cinemas and large consumers' premises supplied from substations on or near them. This involves making known to the brigade the positions of these substations since, with the removal of the formerly compulsory danger notices, it may not be easy to locate them in emergency. It is also very desirable, as the Electricity Commissioners point out, to bring the consumer into the arrangement so that he can appoint an "authorised person," who should be fully conversant with the fire-fighting methods adopted and competent to perform switching duties. There is nothing new in this, of course, as transfer of operational authority by the undertaking, which otherwise has sole charge of its high-voltage gear on a consumer's premises, is already permissible under the Electricity Supply Regulations.

A Zoo Tragedy

THE Zoo correspondent of *The Times* reports the loss of the Zoo's only electric eel. He says that examination showed that death was due to a piece of coiled wire with a sharp straight end which had perforated the stomach. "How the animal got hold of this is a mystery—one flippant suggestion was that he was trying to wire his electric supply."

POWER-FACTOR CORRECTION

Methods Employed on the Continent

By A. Strauss

THE comments on power-factor correction and its special significance in wartime given in the ELECTRICAL REVIEW of August 16th last apply, of course, to British conditions. Some remarks on developments abroad, where I worked on this subject for the last fifteen years, may also be of interest.

On the Continent, as in Britain, the main inducement for power-factor improvement has been given by the tariffs for electricity supply, which have been developed on lines similar to those in this country. There is the kVA tariff, the " wattless unit " charge (mostly if the wattless units exceed 75 per cent of the kWh) and the flat rate with penalty and bonus. A certain difference exists regarding the methods of measurement, and generally this is based on wattless unit meters and wattmeters, in combination with maximum-demand indicators. In some cases when sufficient compensation is proved, a bonus is granted on the normal flat rate without any measuring apparatus.

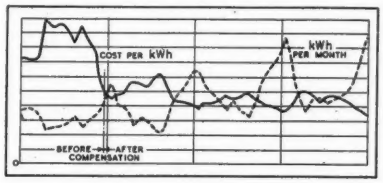


Fig. 1.—Influence of compensation on the cost per kWh

A rural supply undertaking with long overhead transmission lines looks on the question of power factor from quite a different point of view from one in an industrial area or with a widespread underground cable network. Fig. 1 illustrates the influence of compensation under a tariff with kVA maximum demand, in combination with penalty and bonus. It is based on actual supply conditions and shows the lowering of the electricity costs by power-factor correction.

The increase of plant costs per kW caused by the presence of wattless requirements, is illustrated in fig. 2. This figure includes the power station (with high-voltage transformers), high-, intermediate- and low-voltage networks and transformer stations. The total increase between a power factor of 60 as against 90 per cent. amounts in this case to about 35 per cent. As the costs of electricity mainly consist of interest on and depreciation of the capital investment the undertaking would be justified in charging a consumer with a power factor of 60 per cent. at a rate 35 per cent. more than a consumer with a power factor of 90 per cent. The tariffs, of course, are governed by differences in local conditions, and therefore the advantages of power-factor correction given to the consumer vary accordingly.

The power factor has also been improved in many cases of isolated factory plants. For instance the load in a factory power station with two 3,000-kVA generators (one in reserve) was about 2,000 kW at 70 per cent. A load extension of 500 kW would have meant running the second generator in parallel, but by power-factor correction one generator was enabled to satisfy these additional requirements. This example may be typical for conditions in wartime, and it supports the contentions in the previous article in this journal.

The means of power - factor correction abroad are similar to those in this country, but the compensated motor has not been used for many years. The synchronous motor, which was formerly used to a great extent, has also been replaced in nearly all cases where the power factor exceeded 90 per cent. leading. For instance an over-excited synchronous motor of 1,200 kVA, which was installed especially for compensation, has been replaced by condensers. The power-factor correction was not affected at all, but the saving in running costs during the first year was higher than the expense of the complete condenser plant. Apparently in Britain at the present time power-factor correction by rotating machinery is more frequently used. Thus in

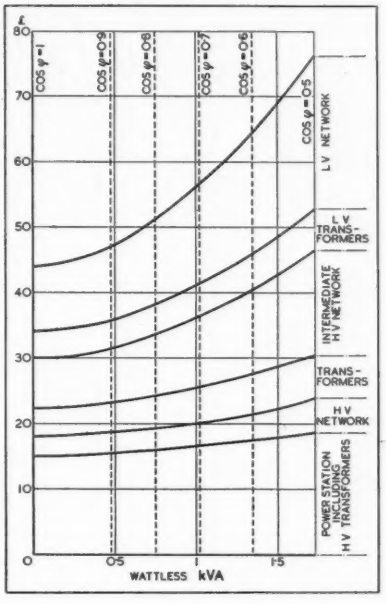


Fig. 2.—Investment costs per kW at different wattless requirements

Fig. 3.—10,000-V condensers in a waterworks

the case of the 700 HP air-compressor motor with a leading power factor of 85 per cent. mentioned in the previous article probably preference would have been given to an

asynchronous motor in conjunction with about 300 kVA of condensers. The losses in continuous working would be less by about 30,000 kWh per year. On the other hand the investment costs would be higher. Exciters for large asynchronous motors have also been replaced in many cases by condensers, which are used for high as well as for low voltages.

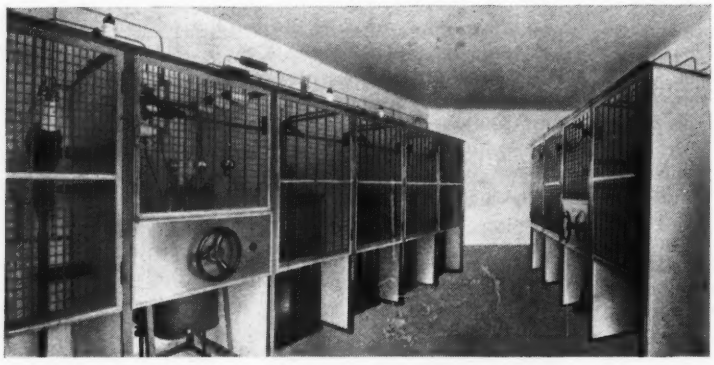


Fig. 4.—Two groups of condensers (10,000 V) totalling 600 kVA

Correction at the load is of course the most useful method, as fig. 2 shows, but special circumstances may lead also to an installation at the point of supply, both on the high- and low-voltage sides. At 400 V the condenser is usually connected to the low-voltage side. At 220 V, on the other hand, the condenser generally costs far more than a high voltage plant, and this often decides the point of connection in favour of the high-voltage network.

A large number of small low-voltage condensers have been connected to the transformers in the villages. Fig. 5 shows an automatic low-voltage condenser control in a fairly small factory. This control apparatus consists of two adjustable two-phase wattless-kVA relays, two adjustable time relays, and a motor-driven controller, for the purpose of operating the contactors. The controller is arranged so as to ensure that charged and discharged condensers are not switched in parallel without a current-limiting resistance between the banks. It also prevents a leading power factor, which would be undesirable. Fig. 6 shows the working of such an automatic control apparatus at different loads.

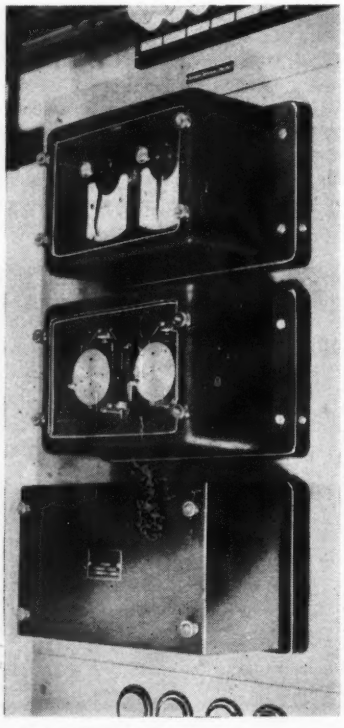


Fig. 5.—Automatic condenser control

Switchgear has generally a great influence on the life of condensers. It is almost impossible to protect condensers by an automatic overload switch, but fairly good protection is given by thermostatically controlled switchgear. Discharging by high-ohmic resistances sometimes proves fatal to the automatically operated condenser, and dangerous to the attendants.

The significance of power-factor correction cannot be over-estimated, especially in wartime. It increases the working capacity of factories in the most economical and most effective way. As a rough estimate, about 1,000,000 kW of working capacity can be gained in Britain by power-factor correction at a cost of only about £2,000,000. From the national point of view, the saving of steel and copper is highly important.

In this respect a special condenser application—not for p.f. improvement—may be mentioned. There are cases of overhead transmission lines, which are not large enough for an additional motor load due to the drop in voltage caused by the additional load. Any alteration in the size of the transmission line can sometimes be avoided by a suitable series condenser, compensating the voltage loss.

Power-factor correction is a valuable asset in peacetime also. The example given in the previous article takes an equipment with 40 HP of motors and a load of 5 HP only. Experience from the time of prosperity in 1928-29, and the crisis of the following years has proved that at no time has power-factor correction been more important from the consumers' point of view than when factory capacities have not been fully occupied.

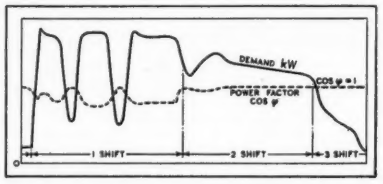


Fig. 6.—Automatic control of condensers at different loads

Case-Hardening

NITRIDING, or the diffusion of nitrogen into steel for surface hardening, consists in subjecting finished machined parts of special steels to the action of pure ammonia gas at a temperature usually between 500 and 530 deg. C., although for austenitic steel 580 to 610 deg. gives better results. In an article by Dr. F. W. Haywood in the *Wild-Barfield Heat Treatment Journal* it is shown that the depth of case varies with the time taken by the treatment, which is normally from 90 to 96 hours. The parts to be nitrided are loosely packed in a heat-resisting steel box with gas inlet and outlet tubes, layers being separated by nickel gauze.

The essential requirements for nitriding are control of temperature within ± 5 deg. C. and a controllable flow of ammonia so that the gas leaving the furnace at that temperature is dissociated to a definite figure. For Nitralloy steels at 500 deg. C. the percentage dissociation is usually between 25 and 35. When nitriding is completed the charge is withdrawn from the furnace and allowed to cool to about 350 deg. C. The box can then cool slowly until the parts can be removed. No further major mechanical treatment is required.

Nitriding furnaces may be of the batch, semi-continuous or continuous type. The first type, electrically heated to ensure close temperature control, is most favoured in this country. The advantages claimed over other methods of case-hardening are that the process is clean, cheap and simple, there is no distortion owing to the low temperature and no deformation, provided the parts are stress-free when entering the furnace, and, as quenching is not required, the risk of cracks is avoided. Slight growth is experienced but this is very much smaller than with carburising. Intricate designs may be nitrided as the process deals with the finished article. The greatest hardness is obtained about 0.003 in. below the surface, gradually tapering off smoothly into the core, thus avoiding the risk of spalling.

TEMPORARY METERING

Unusual Methods Giving Exact Results

By G. W. Stubbings, B.Sc., A.M.I.E.E.

METERING equipment of a temporary kind may be needed in two circumstances: first, when a special consumption test has to be carried out; and, second, when a permanent meter of non-standard kind or capacity has to be removed for overhaul and an exactly similar replacement is not available. Temporary metering may be by exact or approximate methods. An exact method is, as a rule, essential when a permanent meter is temporarily out of service. Exact methods are best for consumption tests, although approximate methods are often used for three-phase supplies. In this article are described some temporary metering schemes, which, although unusual, are exact in character and which yield results of comparable accuracy with that obtained with meters of normal design. When such meters of the required rating are not available these make-shift schemes may be of practical use.

The first scheme of this kind, illustrated in fig. 1, is for the temporary measurement of a three-wire DC supply. The normal method of measurement is by two meters, each carrying a main outer current, and each energised by an outer-to-neutral voltage. In the arrangement illustrated, one meter only carries a main current, the second meter carries the neutral current, and consequently, need be only of small current rating. The polarity of the neutral meter must be carefully checked; this can be done by observing that this meter registers forward when the only load on the supply is one taken from neutral to negative. The principal drawback of this scheme is that, in certain conditions of loading, the neutral meter may reverse. The total consumption in the supply is always equal to the algebraic sum of the advances of the two meters. This follows from the general theorem for the measurement of power in a supply system of more than two conductors. Any conductor may be regarded as a common return, and the total power can be measured by one wattmeter less than the number of conductors. It is immaterial which conductor is regarded as the common return; usually in three-wire DC supplies this is the neutral; in the scheme of fig. 1, the common return is the negative.

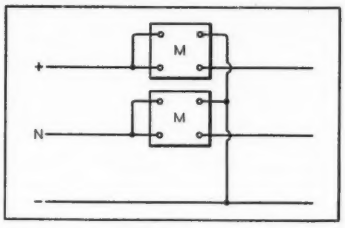


Fig. 1

Another unusual application of this general theorem is found in the arrangement, illustrated in fig. 2, for measuring a three-phase four-wire supply. Here the white-phase line is treated as the common return, and the neutral meter need be only of small capacity, as the normal neutral current will be small relatively to the line currents. By this means a four-wire heavy-current supply can be measured by the use of only two current transformers. As in the scheme described in the last paragraph, careful attention must be paid to the polarity of the neutral meter. This can be checked by observing that the meter registers forward when the only load is between white-phase line and neutral.

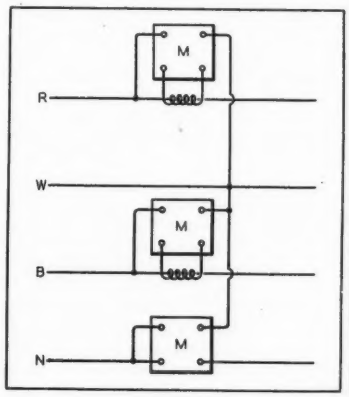


Fig. 2

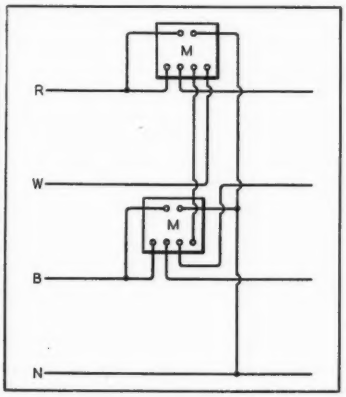


Fig. 3

Fig. 4 illustrates a method of measuring a three-phase four-wire supply which is useful when, as is the case in many undertakings, a number of disused single-phase three-wire meters are available. The method of connection is very simple. One circuit of each meter carries a separate line current, and the voltage circuits are energised from the corresponding line-to-neutral voltages. The current in the third line passes through the other current circuits of the meters in series and in the reverse direction. This method of metering is only accurate when the line-to-neutral voltages have no residue, and it is not now allowed for the measurement of consumers' supplies. The error due to residual voltages is, in practice, generally negligibly small. The correctness of the connections of the meters can be inferred by observing the rates of registration when a unity power-factor load is supplied between each line and the neutral in succession. With red and blue loading the corresponding meters will advance at the same rate. With white loading both meters should advance at the same rate, and this rate should be one half of that observed for red and blue loading.

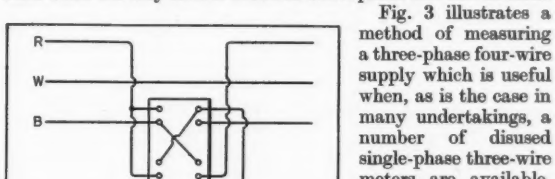


Fig. 4

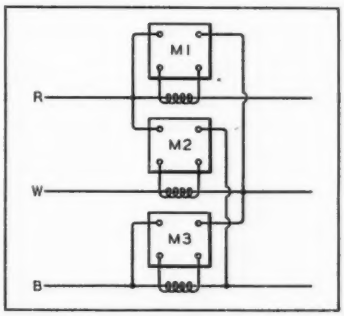


Fig. 5

Consumption tests of three-phase power loads often include the measurement of reactive kVAh. Errors due to unbalance, incident to approximate methods, which depend upon the assumption of load balance, are often too great to be ignored, and more accurate methods are preferable. Fig. 4 shows how an ordinary three-phase meter can be connected so that it will accurately register reactive kVAh, provided only that the voltages are balanced. The multiplying constant is $\sqrt{3}$. The two elements are energised by line-to-neutral voltages which are cross-phased, the red element being reversed. The correctness of the connections can be approximately checked for a lagging power-factor load by disconnecting each voltage circuit in turn. The torque given by the red element should be the stronger; if the two individual torques are about the same, and the power factor is known to be well below unity, the polarity of one of the voltage connections is incorrect.

The reactive kVAh in a three-phase load can be accurately measured by the arrangement in fig. 3 if the meters are energised by line voltages that are cross-phased and if the polarity of the red meter is reversed. The possibilities of wrong connection are, however, too great for this method to be of real practical value but, provided the voltages are balanced, it will give correct results with an unbalanced three-phase four-wire load.

An interesting method of measuring kWh and reactive kVAh

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Scientists and the Nation

IN his address to the Institute of Fuel reported in your issue of October 25th, Mr. W. M. Selvey almost suggests that a classical training merely teaches men to govern a country through the foibles of their fellows. This applies only to men, who for personal gain, debase their classical training. Socrates and Marcus Aurelius alike led men to seek the truth and follow it at any cost. Socrates, refusing to accommodate his teaching to the demands of the local business community was put to death. Another teacher, extending the Socratic principles some 300 years later in Asia Minor, also suffered death rather than be accommodating to local vested interests.

Had our legislators between 1919 and 1939, taken to heart and acted on the lessons of the Punic Wars, Europe would not be in its present chaotic state. For over eighty years our legislators have been less and less purely or merely classically trained, and have come more and more from manufacturing and business circles. Such men, even after an early classical training, are reared on the maxim, "Business is Business," from the time they enter business life. They debase their classical training by using it merely to understand and work on the foibles of their fellows.

WM. T. WARDALE.

Sheffield, *November 1st.*

Wholesalers—and Others

I am anxious to congratulate you upon the leading article published in your issue of October 25th. I feel, however, that there are introduced therein two entirely separate and distinct problems:—(1) The position of a genuine wholesaler in the electrical industry. (2) The "discount snatching" activities of a large number of people who, generally speaking, do not claim to be wholesalers but retailers.

With regard to the latter, I would direct attention to an extract from the presidential address and report by Mr. Walter Riggs at the E.C.A. Brighton Conference on June 29th, 1939:—

> "Turning to the commercial sphere, I have in mind a particular electrical manufacturer who was most sincere in his efforts to support the policy of price maintenance in the electrical industry, but who lent his aid to the existence, among his staff, of a guild designed for the object of securing terms upon tobacco, chocolates, and such like. I also have in mind the name of a very well-known brewery. From my own experience, I am quite certain that the breweries have one of the most successful systems of price maintenance that operates in the country; but this brewery has organised a means by which its staff can buy other people's price-maintained commodities at preferential prices.
>
> "The whole matter seems to me to be one where Government action is required, not only in respect of the Civil Service and similar employees, but also in respect of commercial concerns. I believe that if all retail trade was directed through the proper trading channels, the country, as a whole, would be in an immeasurably better position. In the main, the country is dependent for its income upon the trader; the individual who buys his requirements at a discount to which he is not entitled, contributes nothing to the Treasury in respect of the saving thereby obtained; whereas if the purchase was made through the retail trader at the proper price, tax would be paid on the income thereby obtained, and so benefit the community at large.
>
> "I would, however, renew the appeal for consistency. Many trade associations catering for various commodities are dealing actively with the subject at the present time; but how often do we find those who are most seriously engaged in securing protection for themselves, trying to obtain discounts to which they are not entitled on other people's commodities. . . . I have dwelt on this subject at some length, because I feel that it is an evil which is not only sapping the very foundation of trading stability in our own industry, but is affecting seriously the healthy trading conditions which should obtain throughout the industry and the country as a whole. I agree unhesitatingly with all the efforts which are being made to build up the country's export trade, but in my opinion, we shall be in a stronger position to deal with the export trade when we have eradicated the evils which exist in our own home markets."

May I emphasise two further aspects of this particular matter: (a) The willingness of a large body of manufacturers throughout the country to extend to the staff they employ the same terms as they enjoy on their own purchases of electrical appliances, etc.; and (b) the apparent willingness of several Government Departments to allow their staffs to have the benefit of the *very* low terms which they themselves receive from manufacturers in the electrical industry.

With regard to the former, one only has to think for a moment to realise the tremendous personnel which is to-day employed in the electrical industry; if all these employees can obtain all their electrical requirements at trade terms and very often at even better terms, the market for the electrical contractor and retailer is very seriously prejudiced. With regard to the latter, the war has brought with it an amazing increase in the personnel of the Civil Service; adding to the number employed in the electrical industry the whole of those employed by the nation as public servants, it will be seen how true and important is the view advanced by Mr. Walter Riggs in the second paragraph of the extract quoted above.

Manufacturers should have realised long ago their responsibility to other sections of the industry and have ensured that their employees no longer enjoyed such privileges. The time is also considerably overdue when in fairness to the taxpayers as a whole the Government should stop the abuse which is going on on such a large scale.

On the second aspect of your leading article (and dealing particularly with the article by "A Manufacturers' Representative"), I feel that there is very little justification, if any, for the existence of more than one category of wholesalers; I would suggest the granting of wholesalers' terms only upon an affirmative answer to the following question:—Is the firm in question, because of the stock it carries, the quantities it purchases and the service it gives to the electrical contractor and retailer, rendering a real service to the electrical industry as a whole by

(*Concluded at foot of next page.*)

Temporary Metering (*Concluded from previous page*)

consumptions in a three-phase four-wire load is shown in fig. 5. Here the meters M_1 and M_3 give the kWh consumption in the usual way. Assuming that the load is balanced, $\sqrt{3}$ times the differences of the advances on these meters will give the reactive kVAh. M_2 is a meter connected for approximate reactive measurement, and the advance on this meter, multiplied by $\sqrt{3}$ will also give the reactive kVAh provided the load is balanced. With unbalanced load each approximate measurement must be inaccurate.

Let the incorrect reactive consumption computed from the difference of the advances of M_1 and M_3 be X_1 and let the incorrect consumption from M_2 be X_2. Then the true reactive kVAh is equal to $\frac{1}{3}(X_1+2X_2)$. This statement can be checked for an extreme case of unbalance in which a three-phase load of power factor $\cos\phi$, is supplied from the white and red lines. In this condition the meter M_3 will not register as it carries no current. The advance of M_1 will be the energy consumption in the load, E, so that the false reactive kVAh, calculated from the difference of M_1 and M_3 advances, will be $\sqrt{3}E$. Meter M_2 carries the load current, and is excited by a voltage 120 deg. out of phase with the voltage that supplies it. The rate of registration of M_2 will therefore correspond to IV cos $(120-\phi)$ or to $-\frac{1}{2}IV\cos\phi + \frac{\sqrt{3}}{2}IV\sin\phi$, and $\sqrt{3}$ times the advance, giving another false reactive consumption $X_2 - \frac{\sqrt{3}}{2}E + \frac{3}{2}X$, where X is the actual reactive kVAh consumption in the load. The quantity $X_1 + 2X_2$ therefore gives three times the correct reactive consumption.

ELECTRICITY ON THE LAND

E.R.A. Report Calls for Progressive Programme

THE critical study of the applications of electricity to agriculture and horticulture prepared by the British Electrical and Allied Industries Research Association (Technical Report W/T2; price 2s., postage 5d.) as the starting point for its investigations into this many-sided subject has been written with the double intention of furnishing information about the state of development (in 1938-39, so that the war must have progressively altered the bearing of certain aspects of the report) and of suggesting lines along which research and experimentation would be most likely to lead to improvement.

Most of the information given has been collected from available published matter (a bibliography of 234 references from all parts of the world is included) but the author, Mr. C. A. Cameron Brown, has in a few cases added information obtained privately. His report commences with a general introductory section on the issues affecting the supply of electricity; the nature of the problem is then briefly stated, "the outline of a solution" indicating that something more is required than attention to individual and detached applications. Indeed, the introduction of one labour-saving appliance on its own may result in a merely temporary and embarrassing freeing of labour for which there is for a short time no convenient use. What is required is a study of "farm-yard husbandry", declares the author, welding together into a harmonious whole different perfected individual applications.

In the second and largest section of the report the author turns to agricultural processes, considering in detail the various applications thereto of electrical energy. The difficulties confronting ploughing and heavy cultivations are outlined, but the conclusion drawn is that, in the event of conditions calling for an active solution of the problem, the technical difficulties could be solved.

Barn power is dealt with as a comparatively straightforward application which raises few problems calling for research, other than experimental investigation into the improvement of load factor and further elimination of manual labour. The utilisation of electric power in dairy farming is more economic in character, and research is required to develop the labour-saving aspects of electrical operation to the full and also to improve the methods of loading so as to encourage low tariffs. Work already carried out in this direction is described.

Poultry farming brings in such technical complications as the effect of supply failure on egg incubation and chick rearing, and work on this subject is quoted and discussed, as well as various experimental investigations of the different ways of applying electrical heat to brooders, etc.

The possibilities of applying electrical power to horticulture and to fruit production are each the subject of main sections of the report, but perhaps the most interesting information appears in a section devoted to special applications, which includes crop drying, electro-culture, beehive heating, electric fences, and so on.

In the third section are general conclusions which make it clear that the issues involved are too important to allow development to proceed haphazardly or disjointedly. First, sufficient revenue returns must be obtainable to justify the probable capital outlay, which would be large; secondly, the type of load attracted should be favourable to the maintenance of a good load factor and, thirdly, the farmer should be enabled to derive most benefit from those characteristics of electrical operation that ensure ease of control and from its labour-saving potentialities. It is towards the fulfilment of the last two objectives that research and experiment should be directed.

The war has emphasised the weakness of the farmers' dependence, in so many cases, on outside help in handling crops and feeding stuffs in the farmyard and barn. There are growing indications that they would like to be more independent in these respects and it is believed they would be economically better for a return to such independence. Therefore Mr. Cameron Brown considers the present to be a particularly suitable time and opportunity for the promotion of investigations into the extent to which small machines might be utilised.

In dairy farming the immediate need is said to be for a determination of the extent to which low-pressure steam-raising apparatus can be employed in place of high-pressure boilers.

In poultry farming there is not the same need to watch load factor; rather should attention be directed towards the rationalising of the various methods of chicken rearing, and how electricity might improve conditions in chicken and hen houses. Horticulture is probably the branch of agriculture in which electricity has been utilised least.

Departures from preconceived ideas and attacks from new directions are necessary. Agriculturists have never been in a mood so receptive to unorthodox solutions as they are to-day.

Mr. E. B. Wedmore, director and secretary, Electrical Research Association, 15, Savoy Street, London, W.C.2., will welcome comments and suggestions from those who may have occasion to make use of this report.

Correspondence (*Concluded from page 32*)

reducing the manufacturer's costs of distribution to such an extent as to justify the preferential margin which is given?"

I would like to examine Class C named by your correspondent "the well-established builders' merchant who possesses an electrical department." My own experience is that a large number of so-called builders' merchants cater for the public and in doing so have the advantage of a wholesaler's discount to assist in their selling costs, whereas their competitors, the electrical contractors and retailers, have no such advantage. It is true that, generally speaking, when selling to the public they maintain list prices, but the granting of a preferential discount places them in an advantageous position because of the greater margin they can devote to advertising, etc. The builders' merchant also sells to the builder without an electrical contracting department; the Fair Trading Policy lays it down that no builder is entitled to trade terms or in fact to any discount unless he has an established electrical department.

The Fair Trading Policy is observed by responsible manufacturers in the electrical industry but it would seem that their efforts to establish fair trading are undermined by the willingness of builders' merchants to allow the trade discount to people who are barred by the Policy itself. I am quite content, however, for every builders' merchant who thinks he has a claim to the wholesaler's discount to be judged by the criterion referred to above. Only those in respect of whom the above question can be answered in the affirmative should be granted terms over and above those applicable to the retailer, in which category the remainder really come.

Class E also represents another rather interesting study. The hardware merchant and the ironmonger do from time to time supply certain small traders with their material; I refer particularly to the small jobbing carpenter, to the plumber and to similar people who are more or less exclusively engaged in sundry household repairs. It has therefore been the practice in the hardware and ironmongery trades in respect of such items to receive a preferential discount over and above the terms which are granted to the classes referred to. Such is not the case in respect of electrical merchandise; the electrical contractor does not purchase his supplies through the ironmonger, he buys from the manufacturer direct or through the medium of recognised electrical wholesalers. Such being the case there is no justification whatever for the granting of more than trade terms to the ironmonger with an established electrical department, because the receipt of such terms places him in a preferential position to compete with the electrical contractor and retailer, purely and simply. Once again, however, the granting of wholesale terms to this category should depend upon an affirmative to the fundamental question referred to above.

The various aspects of the whole situation introduced by your correspondent lend themselves to a very lengthy dissertation on the whole subject, but time and space forbid any extension of the views already expressed, at all events at present.

L. C. PENWILL,
Director and Secretary,
Electrical Contractors' Association.

London, W.C.2,
October 31st.

INSTITUTION PROCEEDINGS

Selling Electricity. Sir Joseph Thomson's Work

Supply Organisation

IF the organisation of the electricity supply industry had been in many respects defective due to earlier lack of control and direction, its constituent bodies had done much to remedy that state of affairs during the past twenty years. That was the opinion expressed by Mr. J. E. Nelson (chief engineer, Mersey Power Co.) in the inaugural address which he delivered at Liverpool on November 2nd as the new chairman of the Mersey and North Wales (Liverpool) Centre of the INSTITUTION OF ELECTRICAL ENGINEERS.

In briefly outlining its internal organisation Mr. Nelson remarked that the supply industry employed 118,000 people of whom 22,000 were clerical and administrative, a relatively small number for an industry that employed a capital of £550 million, exclusive of the outlay of the Central Electricity Board. For a long time the industry had been free from trade disputes, representation of the employers and workmen being outstanding examples of the success of Whitley Councils. A joint committee representing the management of the whole of the supply undertakings in this country had been particularly convenient to the Government in the present emergency in introducing certain proposals with regard to war supplies which would have had little chance of general acceptance if the approach had been made to individual undertakings.

The striking growth of output indicated the essential contribution of the supply industry. The continued advance in the uses of electricity in after-war periods was accompanied by improving efficiency of power stations. In distribution there had been less scope because wholesale replacement was not easy, nevertheless the average price obtained per kWh sold was steadily decreasing. For all the undertakings in Great Britain the average figure was 2.48d. in 1921, falling to 1.36d. in 1931 and to 1.04d. in 1937, which Mr. Nelson said was really surprising under the circumstances. Similar figures for domestic sales alone (lighting, heating and cooking) were 5.75d. in 1921, falling to 2.54d. in 1931 and to 1.69d. in 1937 : this reduction was the result of active efforts to cater for householders by offering attractive, if sometimes over-elaborate, tariffs and comprehensive hire facilities. In Mr. Nelson's own areas the average consumption per head of the population was 750 kWh yearly.

Engineers and Managers

The manager of a supply undertaking was usually and properly an engineer, his management being first and foremost concerned with engineering problems, but it should not be forgotten that large modern power systems, which were so full of technical interest, existed for the purpose of producing electricity for sale to the public. Most undertakings had now lived through the lean years of development. To-day, apart from the capital charges on plant, the actual running costs of a modern power station were relatively small, and the aim was to employ the plant as long as possible each day ; in other words, to maintain a high load factor.

No great difficulty was encountered in selling electricity for power, but on the domestic side the rather high prices in vogue in the last decade were still remembered and it was not uncommon for householders to refuse to believe that electricity could be cheap. They neglected to take advantage of the facilities offered by contract rates, apparently under the impression that there was " a catch in it somewhere." That was where the salesman was of value and Mr. Nelson explained that he had found that personal canvass was the most effective means of obtaining new business, and that hire and hire-purchase facilities, particularly for the more expensive appliances like cookers, refrigerators and vacuum cleaners, were essential. In his company's area approximately 85 per cent. of the domestic premises were now connected, but every existing consumer was a potential user of further appliances, and the sale of energy was expected to increase even if further new connections were few in number.

Comparing similar property he found that a consumer on contract used four times the quantity of electricity used by a consumer on the flat rate, but his annual bill was only increased by half ; he was buying additional comforts at a very cheap rate. It was the business of the salesman and of the showroom to keep the user informed of the facilities offered. Showrooms were essential, giving the consumer an opportunity to see new appliances when paying his bill, but they should be suited to the locality in which they were situated. Service to the consumer was another important function, creating goodwill and a feeling of security, all directed to increasing the sale of electricity by which alone any substantial reduction in costs and prices was attainable. Only by making full and continuous use of the plant provided could real economy be reached.

The war had for the moment undoubtedly put a brake on domestic sales, even in districts not seriously affected by war conditions. The unfortunate effect of the ill-conceived Fuel and Lighting Order, now in part temporarily in abeyance, had not completely disappeared. Cost of materials and restrictions on their use, combined with a disinclination on the part of users to incur new expenditure, had reduced the number of new connections very substantially and this was likely to continue until the war was over.

Researches of Sir J. J. Thomson

THE life and work of the late Sir J. J. Thomson was the subject of a recent address by Prof. E. T. Whittaker, president of the ROYAL SOCIETY OF EDINBURGH, of which the scientist was an Hon. Fellow and contributor to its proceedings. After dealing with his early career the professor showed how Thomson took up Lord Kelvin's vortex ring theory of the atom and worked out mathematically the encounters of rings which come within a moderate distance of each other, so as to deflect each other's paths. These results he applied to explain the conduction of electricity in gases, using a model in which the atoms of the gas were represented as vortex-rings and the electric field as a distributor of velocity in the medium.

Being elected to the Cavendish Professorship of Experimental Physics in 1884, he began to combine experimental with theoretical work on electric conduction in rarified gases, and took a leading part in the controversy as to whether the cathode rays were a disturbance of a non-material character like light or a torrent of charged particles, proving decisively that the latter view was the correct one. In conclusion, the speaker referred to Sir J. J. Thomson as the active head and inspiration of a great research school in which most of the eminent physicists now occupying Chairs in the British Empire had been trained.

Position of Engineers

REFERENCE to the accusation sometimes levelled against engineers that they were responsible for the use of their inventions to the detriment of mankind was made in an address on " Engineering and Engineers " which Mr. J. Eccles (chief engineer and manager, Edinburgh Corporation Electricity Department) delivered at the opening meeting of the EDINBURGH ELECTRICAL SOCIETY. The guilt must be laid elsewhere, he said, for the profession had inherently no ethical obligation whatsoever. In view of present conditions, Mr. Eccles considered that the inevitable conclusion was that in addition to using their skill for the better utilisation of natural resources, engineers must, in the future, assume greater control of the activities of the human race in general, in order to prevent their own products from being turned to base uses by others who appeared to be completely devoid of any sort of moral responsibility.

Wartime Lighting Problems

THE joint meeting arranged by the Association of Supervising Electrical Engineers and the Institute of Engineers-in-Charge, previously arranged for November 13th, will be held on Saturday, November 23rd, at Magnet House, Kingsway, W.C.2, at 1.45 for 2 p.m., when Mr. R. O. Ackerley will give a lecture on " Wartime Problems of Industrial and Commercial Lighting and their Solutions." Mr. F. Winstanley, a director of the G.E.C., will preside ; there will be a break for tea at 3 p.m. and the proceedings will terminate not later than 4.15 p.m.

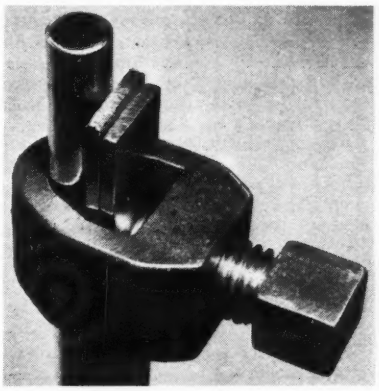
EARTH RODS AND CLAMPS

Some New Designs

By H. G. Taylor, D.Sc.(Eng.), A.M.I.E.E.*

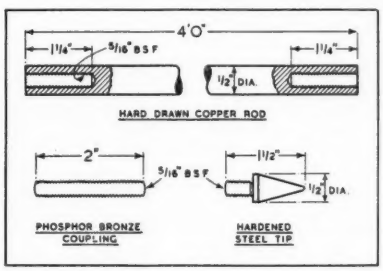
THE primary protection against electric shock is insulation. Insulating materials are, however, liable to deterioration, fracture, moisture absorption or other defects, as the result of which metalwork that is not part of the electric circuit may become alive. Earthing is an essential part of practically all protective systems provided to meet this contingency of live metalwork. Although only a second line of defence it is obviously a very important one, and should be effected with exceptional care since it is seldom tested except by actual operation, and failure to function correctly then may result in a serious or fatal accident. Money spent on good earthing is better than money spent on insurance premiums, since it may prevent the accident occurring rather than provide compensation afterwards.

There are three principal methods of protecting consumers against electric shock; each has a particular field of application where it has outstanding advantages, but there is a large common area in which any one of the three methods may be employed and the one adopted depends largely on the custom in the country concerned, the safety regulations or the preference of the engineer. Whichever method is used earth electrodes are required, and they are also, of course, needed for the very large amount of earthing which is carried out at sub-stations, and in connection with overhead lines.



Type "A" gunmetal clamp suitable for ½-in. and ¾-in. tape

The most popular type of electrode, and the one which is rapidly displacing other types is the rod or tube. It is popular because it gives a lower resistance for its cost than any other type, it requires no excavation, it can be installed in any patch of ground no matter how small, its connection is available for inspection, it can be driven to a very considerable depth to find permanent moisture or a low resistivity layer of soil, and finally, if the site chosen proves to be unsatisfactory, it can often be withdrawn and installed elsewhere. These advantages place the rod or tube electrode in a class by itself.



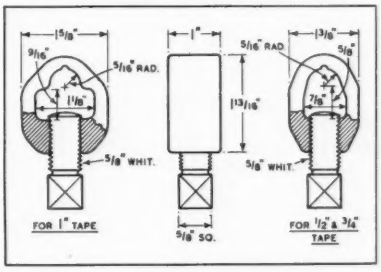
C.D.A. earth electrode

As the diameter of an electrode has a very much smaller influence on its earth resistance than the length, the most economical use of material is obtained when the rod or tube is just sufficiently large in diameter to be driven without buckling. A common size of steel electrode is ¾-in. diameter rod or 1-in. diameter water tubing; the latter has an outside diameter of $1\frac{5}{16}$ in., and provides a very substantial electrode. These sizes are, however, somewhat larger than is really necessary, since ½-in. diameter rod may readily be driven, but with steel allowance must be made for corrosion. If copper is employed rather than steel the corrosion is reduced to negligible proportions, and a ½-in. diameter rod may be used. The material should be hard-drawn, and it may then be driven in almost any type of soil by using a light hammer or, preferably, an electric hammer which applies light blows at a rapid rate.

It is a common fallacy that earth rods should be driven to a depth of about 6 ft., and that there is little advantage in increasing the depth beyond this. In actual fact the resistivity of the soil often diminishes as the depth increases and in such cases it is definitely advantageous to continue driving to as great a depth as possible. Depths of over 100 ft. have been reached in America—in this country 50 ft. is the maximum so far attained. The maximum length of individual rod which can conveniently be handled is 8 ft., and therefore coupling must be resorted to in order to secure deep electrodes. An 8-ft. length is actually somewhat unwieldy, particularly as the electric hammer must be fitted on the top of the rod. It has therefore been found much more convenient to use 4-ft. rods; these may be driven without the erection of staging, and there is negligible whip of the rod—a feature which gives rise to some loss of energy when longer lengths are used.

Only one design of rod is used, the tip being screwed into the first section. This is preferable to having a special pointed rod for the first section, and enables a hardened steel tip to be employed—a feature which has considerable advantages in hard or stony soils. It has been suggested that rods should be coupled by turning an external thread on one end to fit an internal thread on the other, but the disadvantage of this is that the external thread would be liable to damage in transit, and being only in copper would be relatively weak. By using phosphor bronze these disadvantages are overcome. The size of $\frac{5}{16}$ in. B.S.F. thread has been chosen so that the tensile strength of the phosphor bronze coupling is approximately equal to that of the tapped copper rod. By making the length of the coupling rather less than twice the depth of the hole it is ensured that on screwing up the two rods butt tightly together.

The chief feature of an internal coupling is that the rod is in contact with the soil for the whole of its length—in fact it is in such intimate contact that all oxide is cleaned off, and after driving a few feet the rod is as bright as if it had been specially polished. This was revealed when a rod, after being driven horizontally through 12 ft. of soil, crossed a narrow trench, where inspection of the rod surface was possible. When external couplings are used only the first section makes really good contact with the soil owing to the enlargement of the hole by the coupling. The effect of this varies with the type of soil. If the upper layers have a high resistivity, and it is merely desired to reach moist soil, then there is no disadvantage in having external couplings and driving is possibly easier in some soils, but if there is no sudden change of resistivity it is preferable for the rod to be in good contact with the soil throughout its length and this is ensured by the use of internal couplings of the type shown.



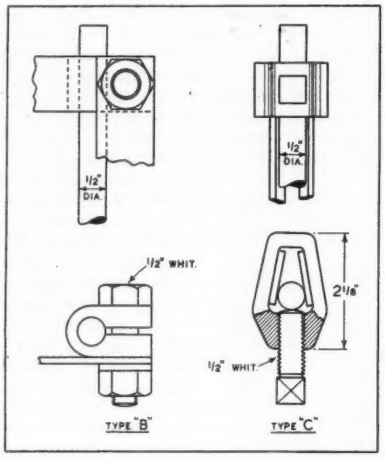
C.D.A. earth rod clamp, Type "A"

Another feature of the C.D.A. earth electrode is that it can be used as the first section, the last section or any intermediate section. Thus the electrode can be completed with any number of sections—it is not necessary to use a special one as the last—and there need be no wastage in purchasing the rods, such as would be caused if special intermediate or end sections were left over after the job was finished. In advance it can be decided how many feet of earth electrode are required and this

* Electrical engineer, Copper Development Association.

may be installed in any number of lengths—not necessarily all equal—in accordance with the condition of the soil.

The method of making connection to a rod is almost as important as the installation of the rod itself. Most generally connection must be made to copper tape measuring possibly 1 in. by $\frac{1}{8}$ in. or $\frac{1}{2}$ in. by $\frac{1}{8}$ in. These are common sizes for lightning conductor and substation work, though for domestic use a round wire is more usual. To prevent the corrosion which is always liable to occur between dissimilar metals when exposed to the atmosphere it is essential that the clamp used should be made from a suitable copper alloy. It should also be simple to make, with a minimum of machining, and simple to apply.



Types "B" and "C" earth rod clamps

This clamp is manufactured from two gunmetal castings, and the only machining which is necessary is the screw thread. The Type "A" clamp illustrated will take one, two or three copper tapes in addition to the rod and it will also take a wire in the groove provided at the back of the clamp. The use of a $\frac{5}{8}$-in. diameter screw enables a very high pressure to be obtained—of the order of several tons—and thus intimate contact is ensured between the earthing lead and the rod, oxidation at the contact is prevented and, owing to the proximity of heavy metal sections, any heat generated at the contact is readily conducted away. In addition the contact resistance, which is a function of the total pressure (not the intensity of pressure), is very low, and the slipping torque high. The contact resistance of such a clamp may be as low as 0.0002 ohm—thus a fault current of 1,000 A would generate only 200 W at the point of contact.

For those who prefer a more orthodox design Type "B" is suitable. This has larger surface contact areas, and by the use of a bolt of appropriate length can be used for any number of tapes, and is, of course, suitable for a cable lug which cannot readily be used with the previous type. Type B has, however, several disadvantages, the most important being the large amount of machining which is required—a particular disadvantage in these times when all machine tools are in use to the maximum possible extent. In this type castings are again suitable, but the hole, the split and at least one face must be machine finished. Furthermore there are three separate parts as compared with two in the other design, and the tapes must be drilled on site—an operation which it is preferable to avoid.

A third design of clamp, Type C, has the novel feature of using a wedging action to increase the pressure between the earth electrode and connecting tapes. By this means even better contact than with Type A is secured, and a smaller screw may be used. The clamp has the disadvantages that it will only take one or two strips and is unsuitable for use with a wire or the usual designs of cable lug. If only one strip is used it must be doubled back on itself to provide the two contacts or a short length may be cut off and used for the purpose. This clamp is suitable for almost any size of tape.

Electricity in Aircraft

Present and Future Loads

DURING the last war electricity was employed in aeroplanes for ignition only and it was not until later that instrument lights were added. Satisfactory magnetos being unobtainable, a generator with small storage batteries was used. Later came a reversion to magneto ignition.

In papers presented at the National Aircraft Production Meeting of the Society of Automotive Engineers, California, Mr. P. C. Sandretto, stated that during the last ten years the electrical loading for commercial planes had grown from 2 to 15 kW. Taking as an example the Douglas DC-3 plane with twenty-one seats and a gross weight of 24,800 lb. (the commonest in commercial use in the United States), he mentioned twenty-eight items of electrical equipment. These included lights for warning, landing gear, engine starters, fuel and oil-pressure indicators and booster coils; they required 1,160 ampere-minutes for a five-hour flight. There was also such apparatus as windscreen defroster fans, pilot heaters and wing de-icers bringing the total operation requirements to 11,730 ampere-minutes during the same period. In some planes electric landing gear and flap motors provided an additional load. For the convenience of passengers electricity was used for such purposes as cabin, buffet, companion-way and entrance door lighting, stewardess call light and cabin and seat-belt warming.

Instruments for indicating altitude, position, safe path to follow and distant atmospheric conditions required AC and DC voltages of from 1.5 to 1,000 V, while equipment now in the laboratory stage called for 10,000 V.

Usually the source of power for the Douglas DC-3 plane was two 12-V, 50-A, DC generators and two 65-Ah batteries (five-hour discharge rate). The generators, which were geared directly to the engines and driven at $1\frac{1}{2}$ times engine speed, fed two independent sets of busbars and a generator or battery could be connected to either or both sets.

Voltage control was obtained by a Tirrel regulator incorporating both current and voltage relays, the former limiting the demand. An inverse-current relay prevented the battery from discharging through the generator. One of the chief electrical troubles had been the "freezing" or failure to make good connection of the contact points of the voltage regulator, making a change desirable every 100 hours. The aim of United Air Lines was to make them serviceable for one engine-change period, 625 hours. During the past six months the inverse-current relay had been replaced by selenium rectifiers, eliminating frozen contacts. By this means the two busbar systems could be paralleled, the drop through the rectifier serving as an equaliser. This modification had given fair service but was not entirely trouble-free. Generators, apart from brush trouble, had been satisfactory.

A larger type of Douglas plane, the DC-4, which was projected for commercial transport next spring, would carry forty passengers and a crew of five. Its total electrical load, amounting to some 15 kW, would be supplied by four 3-kW 24-V generators driven from the main engine through a three-to-one gear ratio and operated in parallel. A single 24-V 65-Ah battery would be installed for starting the engines and supplying eleven radio units, instead of four as in the present model.

The voltage regulator employed a voltage-sensitive element actuating a motor-driven field rheostat and a small selenium rectifier actuating a large relay which prevented flow of reverse current. There was no current-limiter. This design, together with a distributed field winding on the generator, which gave regulation for current changes of reasonable magnitude, was expected to reduce maintenance considerably.

The next step, Mr. Sandretto suggested, would be a four-motor plane of 100,000 lb. gross weight carrying 100 passengers and a crew of seven. For meeting its electrical requirements of 30 kW there would be four 7.5-kW, 115-V, 4,000-RPM alternators each mounted directly on the engine, the frequency ranging from 300 to 900 cycles. Each alternator would supply an individual set of busbars to which would also be connected a 65-Ah 24-V battery, *via* a transformer and rectifier. The latter combination would furnish power for minimum essential loads as well as to the starter motors. The exciter voltage would be 500 in order to permit the use of trouble-free thermionic voltage regulators.

He estimated the total weight of electrical equipment in commercial planes of the future at about 450 lb. or 15 lb. per kW. There would be a saving of 350 lb. in wiring and conduit weight over a 24-V system. Transformer weight would be 70 per cent. of those for 60 cycles and auxiliary supplies should not weigh more than one-half of rotating machinery.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AS we reported last week, the Edinburgh Corporation has disapproved a recommendation that a payment of £1,000 should be made to **Mr. E. Seddon,** former engineer and manager of the Electricity Department. The grant recommended was "for work connected with the design of three large extensions to Portobello power station and the development of the distribution system." Supporters of the proposal spoke of the skilful work done by Mr. Seddon in connection with the extensions, and stressed that they were dealing with a department with a revenue of considerably over a million pounds and an annual expenditure of over £800,000.

Moving disapproval of the recommendation, a member contended it was wrong to make gifts to officials who had been paid satisfactory salaries. Mr. Seddon's salary on his appointment, it was stated, was £1,200. It was increased to £1,500 and later to £1,700. Mr. Seddon was retiring five years before the compulsory retiring age on account of ill-health, on a pension of £1,100. Sir Alex. Kennedy, it was claimed did the original work on the first extension, the building was designed by the city architect, and all the structural work was designed by a member of the Dean of Guild Court. The plant was not designed by Mr. Seddon, it was argued. Mr. Seddon, said the member moving disapproval, told them at the time that there was a lot of technical work involved, and they appointed a technical assistant, a first-class man who was now manager. Another councillor said that they would be breaking the terms of Mr. Seddon's appointment in granting the proposed payment. On a division 35 voted for disapproval, 12 for the recommendation, and five abstained.

Mr. H. J. Allcock, who is chairman of the Transmission Section of the Institution of Electrical Engineers for 1940-41, was educated at Taunton School, and the University College of South Wales and Monmouthshire, and received his practical training as a college apprentice with the Metropolitan-Vickers Electrical Co., Ltd.

Mr. H. J. Allcock

From 1924 to 1926 he was liaison engineer with the Westinghouse Electric Co., East Pittsburgh, on behalf of the Metropolitan-Vickers Electrical Co. A year later he joined Callender's Cable and Construction Co., Ltd., as technical assistant to the Cable Department manager, subsequently being promoted assistant to the chief engineer. He is now process manager to the company, being responsible for the design of products and technical control of factories.

He has contributed a number of articles to various technical journals on problems connected with cables.

Mr. Allcock served in the last war from 1914 to 1918, rising from the ranks in the R.E. to commissioned service with the Welch Regiment and has since had approximately four years' commissioned service with the Territorial Army, Royal Corps of Signals.

Mr. H. A. Wadeson, of Preston, has been appointed mains assistant with the City of York Electricity Department.

Mr. W. Krause, of the carbon department of the General Electric Co., Ltd., retired on October 31st after thirty-four years' service with the company. Mr. Krause has had a life-long experience of carbon arc lamps, and was associated with some of the first street lighting installations by carbon arcs carried out by the G.E.C. in the London boroughs and elsewhere over thirty years ago. When the carbon arcs for street and factory lighting were superseded, Mr. Krause applied his expert knowledge in that line to the requirements of the photographic, cinema and electro-medical industries.

Mr. G. V. Stanway, a director and works manager of Howells (Electric Motors), Ltd., of Hanley, Stoke-on-Trent, has been elected president of the Stoke-on-Trent Association of Engineers.

Mr. E. W. J. Newland, of the sales and development department, City of Birmingham Electric Supply Department, has been commissioned in the Royal Engineers. He has the distinction of having served in all three Services.

Mr. N. Pickles, B.Sc., has been presented by members of the Halifax Corporation Electricity Department with a barometer and electric clock on the occasion of his wedding to Miss Mary Lambert.

Mr. F. P. Wilton, shift engineer with the Horsham U.D.C. Electricity Department, has resigned after twenty-one years' service owing to ill-health.

Mr. R. R. Dewsnup, B.Eng., A.M.I.E.E., electrical engineer with Imperial Chemical Industries, Ltd., Metal Group, has received a commission as second-lieutenant in the Royal Engineers. His previous associations have been with the University of Liverpool, Johnson & Phillips, Ltd., the Admiralty and the Royal Navy.

Mr. A. W. Clegg, borough electrical engineer at Accrington, who has completed forty years' service with the Corporation and had intended to retire, is to continue at the special request of the Electricity Committee.

Mr. R. A. Brown, assistant mains engineer in the Eastbourne Electricity Department, has decided not to take advantage of the Council's proposal that he shall continue for a further year and has retired. It is not proposed to fill the vacancy at present.

Mr. J. Anderson, A.M.I.Mech.E., general manager of Ruths Area Accumulators, Ltd., has been elected a director of the company. Mr. Anderson has been with the firm since its inception, and has a wide knowledge of both the commercial and technical sides of the business.

Mr. H. G. J. Gerrard, mains superintendent with Lancaster Corporation, has been appointed to a similar post with Doncaster Corporation.

Rotherham Corporation Transport Committee has appointed **Mr. G. W. Robb,** of Brighton, as rolling stock superintendent at a salary of £500 a year.

Mr. L. J. Gooch, A.M.I.E.E., and **Mr. L. Honey,** who have been with Marryat & Scott, Ltd., for many years, have now been appointed directors.

Mr. Gooch joined the company seventeen years ago as a technical representative. He was appointed sales manager in 1925, and now as a director his responsibilities include supervision of sales and site erection. He has written a number of papers on electric lifts and for five years was lecturer on this subject at the Borough Polytechnic.

Mr. Honey has been employed by the company since 1919 when he commenced as draughtsman. He was afterwards appointed to the estimating department, became chief estimator and was put in charge of all export business. Later he became production manager. His main duties are supervising estimating and production.

Mr. L. Honey

Mr. L. J. Gooch

Obituary

Mr. J. R. Marsh.—We regret to learn of the death of Mr. J. R. Marsh, meter superintendent of the Electricity Department of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board, which occurred on November 1st after a long illness. Mr. Marsh had been in the Board's service for 24 years.

Mr. L. G. Poole, apprentice supervisor and canteen manager at the Coventry works of the British Thomson-Houston Co., Ltd., was recently fatally injured as the result of a road accident. He was fifty-five years of age and had had a varied career.

Mr. J. Mackersie.—The death occurred at Dundee on October 29th of Mr. James Mackersie, of J. Mackersie & Co., electrical engineers and contractors, Dundee. Mr. Mackersie, who was seventy-four, was an associate member of the I.E.E.

Mr. D. Cooper.—The death has occurred in Glasgow at the age of eighty-five of Mr. David Cooper, a director of Clyde Valley Accessories, Ltd., the Clyde Valley Electrical Power Co., the Lanarkshire Hydro-Electric Power Co., and the Strathclyde Electricity Supply Co.

Mrs. Mordey.—The death is announced of Mrs. Fanny Mordey, widow of Mr. William Morris Mordey, which occurred on November 5th at the age of sixty-seven.

Wills.—Mr. Alfred Shepherd, vice-chairman of the Lancashire Electric Light & Power Co., Ltd., and the Lancashire Electric Power Co., and chairman or director of a number of trust companies, left personal estate in Great Britain of £118,707.

Mr. C. F. Spencer, chairman of the Edison Swan Electric Co., Ltd., and a director of John Brown & Co., Ltd., Thomas Firth & John Brown, Ltd., and of a number of other companies, left £92,448 (net personalty £44,540).

Mr. W. B. Woodhouse, M.Inst.C.E., M.I.E.E., of the Yorkshire Electric Power Co., left estate, so far as can at present be ascertained, valued at £33,307 (net personalty, £10,449).

CABLE MAINTENANCE

Wartime Problems for Mains Engineers

By M. Cline, A.M.I.E.E.

IN this "total" war the home front, with all its complex and delicate organism, is being subjected to as fierce a fire as the former military front line which, at least, was usually set up with an eye to probable bombardment. As far as the mains engineer is concerned, his world, even in peacetime, had periodically to withstand onslaughts from within when, on account of faults, large amounts of power got out of hand. He is, therefore, somewhat prepared for wartime conditions, the difference being in the numerical increase in breakdowns.

Some preparation will have been made to provide for this in the way of additional personnel and, in some cases, the temporary transfer of operatives to the more affected areas. In many cases, however, repairs have to be completed in a fraction of the time they would take normally and one must look to modifications of methods of carrying out the work as the most fertile means of reducing the average time of interruption of supply. Perfect quality must be dispensed with, together with the usual high factor of safety; it must still be a reliable job for the time being, but speed is the essential thing. More normal and permanent repairs can be carried out later.

With aerial bombardment many variations of intensity of damage are likely to occur. If small, the repair can be carried out as thoroughly as in other days. It is when the damage is on a wholesale scale and likely to be augmented by following raids that different methods must be adopted.

Underground Cables

A bomb exploding on a cable route at any rate carries out part of the excavation necessary for the repair. Assuming the excavation to be free from war gas, further excavation is carried out to reach that section which is undamaged and the necessary length is laid to joint on to the two sound ends.

If, as often occurs, gas and/or water mains are involved, it may be impossible to carry out the work on the site of the crater owing to fire or flooding. The quickest method then may be to excavate down on either side of the crater some distance away according to circumstances and to by-pass the crater, if necessary laying the cable on the surface possibly in loosely laid steel pipes which have been previously stocked for the purpose. This method would be necessary also where a persistent war gas or delayed-action bomb prevented access to the crater.

The jointing time would have to be severely curtailed. The following material should be at hand for this purpose:—Wood or concrete joint boxes already prepared for the various voltages and sizes of cable; plastic material for stopping compound leaks in these quickly assembled boxes; rapid-setting cold compound or, failing this, a normal compound which has been heated and allowed partly to cool; mechanical connectors which obviate the sweating of the conductors; and porcelain core separators.

The cores are prepared by removing the paper insulation as usual, the connectors are fixed, separators put into position, and the box assembled and filled up. This joint, which is minus taping, sweating of cores or plumbing, could be made by a man much less skilled than the usual plumber-jointer, and this would open up a means of materially increasing the number of operatives by employing jointers' mates and other semi-skilled men, some training having been given to them in advance.

It is very important that gangs of men should be available to excavate down to a sound portion of the cable as soon as possible on account of the presence of large quantities of water likely to escape from fractured water mains or from fire-fighting appliances in the vicinity. A decision should be made as to whether it is possible to pump the crater dry or whether excavation should be carried out nearby, remembering that in some old cables water will find its way downhill for distances approaching one hundred yards in twelve hours and, by capillary action, uphill for several yards, either just under the sheath or through the interstices in the cores.

For oil-filled cables, with oil duct, wooden plugs should be made in advance and be in every jointer's kit for the purpose of stopping the flow of oil before the reservoir tanks run dry, or, if too late for this, to prevent access of water to the duct. While a temporary joint could be made in all solid-insulated cables up to, say, 66 kV, the problem of dealing hurriedly with damage to oil duct cable is more complicated. In extreme urgency, an oil-filled cable could be jointed up to run, no doubt for a week or two, in a dry condition. This should, however, be avoided if at all possible on account of the risk of producing breakdown at other points on the route in which it differs from solid cable, where the point of repair is, and remains, the weakest link. A safer course would be to refill the cable and joints but to cut down materially the time taken in the impregnation process, which ordinarily would involve the application of vacuum for many hours to withdraw all air from the oil and cable.

With a large interconnected feeder system it will, on occasions, be possible to cut and cross-connect sections of cables in the same cable run to make at least one sound through cable, no repair work being done in the vicinity of the crater.

The wrecking of a substation in whole or part has also happened in other days from more ordinary causes. The procedure of by-passing the substation by lengths of cable jointed outside the affected site is obvious, but if only part of the gear is damaged, a useful piece of apparatus to have prepared in advance is a jumper cable complete with switchgear connections, by means of which the by-pass can be effected in a matter of minutes. Emergency connections to transformers in enclosed substations, being protected from the weather, can be made with open connections fixed on insulators or even supported by insulating tape.

For outdoor substations damaged cable terminations, if spare sealing ends are available, can be reassembled, using technique similar to that employed with joints. If not, the sound cable-end is extended, by means of mechanical connectors, to the transformer terminals, by conductors heavily taped and painted with bitumastic to render them temporarily waterproof.

Overhead Lines

The damage to pole lines is in general likely to be considerably less concentrated than that suffered by cables on account of their diffused manner of construction and also to their rural situation. Nevertheless, there is by no means complete immunity on account of disabled planes, barrage balloons and bombs in the vicinity during an air battle.

The time-paring which can be exercised in the making of cable joints and the like is not so feasible in the repair of overhead lines, as the completed work is subjected to mechanical, as well as electrical, strains. These mechanical forces operate immediately, and without due care or through the use of weak alternatives, the results may have no duration at all, whereas with normal cable jointing much of the time spent on careful sweating of cores, taping, plumbing and vacuum filling is to counteract those slowly operating cumulative breakdown factors like ingress of moisture, electric discharge, movement of cores and so on. However, by arranging suitable organisation and having at hand the necessary gear, the maintenance staff soon become accustomed to carrying out extensive repairs very much more quickly than in the ordinary way.

Take, for example, a hypothetical case of a plane crashing into an overhead line, bringing a pole support, conductors and auxiliary cable to the ground, at the same time causing three of the neighbouring poles on each side to deflect noticeably and the ironwork on the poles in the immediate vicinity to buckle permanently in the direction of the strain. We have then to replace one pole, three sets of pole ironwork, a span or so of conductor and the auxiliary cable and its catenary wire. In ordinary times this would be a minor disaster, and one could be excused for spending a day or two on the repair. But this job, and others like it, must be completed in a few hours and the procedure could take the following course.

While the pole is being excavated for and erected near the damaged one (for light lines a pole-boring tool provides a quick method in suitable ground) vices are fixed on to the broken ends of the conductor and by the use of snatch blocks and a neighbouring pole to anchor the winch or blocks and tackle, the conductor ends are drawn together and a mid-span core connector joint is made. If there is not a clean break, or if the conductor is burnt, a suitable length is let in, using two con-

nectors, carefully measuring the discarded piece and replacing it by an exactly similar length so that time spent in resagging of the line may be avoided. A small error may show itself here in the sagging on account of the elongation of a conductor while it was being broken by strain with perhaps the others burnt through by the power arc. When this method can be employed, however, there will be no need to wait for the erection of the new pole before repairing the conductors and also the linesman will not require to take a second purchase with his vices on account of serious error. Of course, if the conductors are disintegrated over a distance, recourse to a sag chart will have to be made and a marker put on the pole supports, at the required point, for sighting purposes, well in advance of time.

Automatic vices, which are merely slipped on to the conductor and tightened with the tension applied, are the best to use for this hurried work. A length of cable to replace that rendered faulty is fixed in position on the catenary and jointed. Being in the centre of the double span, with the catenary if necessary lowered at points of support beyond the damage, the cable will be brought down to near ground level, thus facilitating fixing and jointing. Damaged ironwork on the various poles can be renewed. The identical type will not always be available, but appearance will not matter and other types of similar strength could be used.

With light-calibre bombs exploding near lines, damage can be expected through flying fragments cutting through conductors and supports, in general affecting only two or three spans. The blast effect of heavy bombs would probably be effective over longer distances. Craters which are weakening a pole support, if very large, may necessitate the shifting of the pole position longitudinally or, if this is not possible, laterally to the line, imposing a small angle which need not entail alteration of the existing straight-line ironwork. Splinter holes in wood poles can be considerable before the support is endangered and should be filled up with wood plugs and tar.

The following factors will tend to bring war damage to supply mains under quick control :—Co-operation between neighbouring authorities for inter-loan of personnel, transport, gear and materials ; dilution of skilled labour ; and provision for comforts and feeding of working gangs during continuous periods of repair work.

Resistance Welding

New Heavy-duty Machine

WHAT may seem at first sight unlikely subjects for welding can often be treated in this way by carefully anticipating the conditions. Each welding possibility must, however, be considered on its merits and not crippled by attempts to improvise a solution from some standard machine not suited to the special requirements of the case, and the advice of manufacturers should be sought.

As an example of what can be done in this way, the Metrovick "ASP" heavy-duty spot welder (which is flexible enough to deal with light work also) can be adapted for projection welding by changing the electrodes, which are bolted to top and bottom platens, for contact blocks. A 12-in. diameter double-acting cylinder provides a maximum pressure between platens of 9,000 lb. from air supplied at 80 lb. per sq. in. from reservoirs built into the top of the frame. Within the frame is a 250-kVA welding transformer having a secondary winding consisting of copper tube of square section brazed into cast-copper headers through which the cooling water circulates. The primary has five tappings and a series-parallel connection, all taken to a double-unit tapping switch on the frame giving a wide range of welding currents.

Above : Double-purpose heavy resistance welding machine with electrode set up for spot welding. Left : Welding head set up for projection welding

For straightforward projection welding, a contactor and timing device for controlling the duration of the weld have been found quite satisfactory. For more involved work, especially spot-welding of heavy sections, the interrupted-current method is said to offer considerable advantages. This method with "woodpecker" control depends upon the employment of synchronous timing devices that allow instantaneous switching of heavy currents (there being no inertia due to moving parts) and permits the application of repeated and predetermined current impulses by a single operation.

By the use of interrupted current the life of electrodes when spot-welding heavy sections is much increased and greater thickness of metal can be dealt with by any given machine. It is of advantage also on jobs that tend to "flash" or blow out weld metal during the passage of the current. When spot-welding thick pieces of steel together, the heat generated, combined with the high pressure applied to the electrode tips, tends to cause the material to anneal and the tips to "mushroom out" and fuse to the steel. While the time between impulses allows the water flowing to the electrodes to control the temperature of their tips, the interval is insufficient for appreciable heat to be lost from the inside surfaces of the plates where the weld is being formed.

The control consists of an Ignitron panel for determining the welding current and a small panel mounted on its side housing two Thyratron-controlled relays for regulating the time at which set-up pressure is applied and the length of the forging period. The latter is the time of pressure "dwell" after the weld is completed and before the electrodes are allowed to separate. A differential pressure on the piston is obtainable by electrically operated air valves and the air can be exhausted underneath the piston at any desired stage of the cycle by means of the Thyratron relay in order to apply a sudden pressure increase to the electrodes. This upset pressure is of considerable value in consolidating welds made in the thicker sheets and in obtaining a flush joint on projection-welded assemblies.

COMMERCIAL and INDUSTRIAL NEWS

Export Licences. Wage Increase Refused. Safety in Factories.

Engineers' Wages

A MEETING of engineering employers held on November 6th rejected claims of the Amalgamated Engineering Union and the National Union of Foundry Workers for 3d. an hour increase on basic rates and the restoration of the pre-June, 1931, working conditions, and of the Confederation of Shipbuilding and Engineering Trades, representing over thirty unions, for a flat increase of 10s. a week. Sir Alexander Ramsay, director of the Engineering and Allied Employers' National Federation, in a statement giving reasons for the rejection of the claims, said that the advance of wages in engineering would add to the cost of war production and therefore to the national expenditure and the burden must fall on the community. He also pointed out the injurious effects of prices and wages pursuing each other. He produced a table of actual earnings in the engineering industry and another table of comparative earnings in engineering and other industries to demonstrate that engineering workers were not in a disadvantageous position. A meeting of all the executives of the unions and the Confederation is to be held at York on November 19th, and the Executive Committee of the A.E.U. is also holding an early meeting to discuss the situation.

Electric Milk Vans

Although the business is naturally restricted by war conditions, it is pleasing to see that electric vehicles are still being supplied. One of the latest deliveries is that

Additions to the Leicester Co-operative Society's fleet of milk vans

of two electric milk vans to the Leicester Co-operative Society to augment its existing fleet. They were supplied by Sunbeam Commercial Vehicles, Ltd. The chassis are the Sunbeam M.B. 12-15 cwt. type and the bodies were built by the Leicester Carriage Builders and Wheelwrights, Ltd.

The company has also recently received repeat orders from the Oxford and Bolton Co-operative Societies and Hickmans and Mould, the large Midland milk distributors.

Works Safety in Wartime

This is the title of a pamphlet issued by the Ministry of Labour and National Service. It describes a scheme worked out by the Ministry in conjunction with the National Safety First Association to safeguard new workers in factories and those who have returned to industry after a long period of unemployment and are out of touch with industrial practice, especially as speeded up by war needs.

The scheme provides for the issue of this pamphlet to be followed by a regular weekly poster service, copies of the monthly "Industrial Safety Bulletin" and of a series of four pamphlets; the number supplied is based on the number of workers engaged in the particular works.

The pamphlet stresses the necessity for works safety organisations and gives an outline of the essentials of such a scheme under the headings:—Support of the Management; Safety Committees; Inspections and Investigations; Propaganda; and Accident Records. Another section deals with the subject of first aid while at the end a list is given, with prices, of posters, booklets and leaflets obtainable from the National Safety First Association, 52, Grosvenor Gardens, London, S.W.1.

Air-raid Replacements

The Board of Trade has issued open licences under the Limitation of Supplies Orders to permit dealers to provide without restriction certain necessities to replace goods destroyed during air raids. They can, however, be delivered only to authorised officers of the Women's Voluntary Services for Civil Defence. The goods scheduled include domestic hollow-ware and household electrical appliances.

Export Licensing

The Board of Trade has made the Export of Goods Control (No. 39) Order (1940) (S.R. & O. 1940 No. 1932) which comes into force on November 15th, by which the lists of goods subject to the existing Export of Goods Control Orders are consolidated, the lists of destinations to which all or certain goods may only be exported under licence are revised as set out below.

On and after November 15th no goods may be exported without licence to:—Bulgaria, Estonia, Finland, French Colonies and Mandated Territories (other than French Cameroons, French Equatorial Africa, French Settlements in Oceania, New Caledonia, New Hebrides and French Settlements in India), Greece, Hungary, Latvia, Liechtenstein, Lithuania, Poland, Roumania, Sweden, Switzerland, Vatican City, Yugoslavia, or to any port or destination in the Union of Soviet Socialist Republics on the Black Sea, Baltic Sea, or to enemy territories.

The position with regard to the goods included in Lists A and B is not changed by this Order. The goods included in List C may not be exported without licence to:—Andorra, Faroe Islands, Formosa, Iceland, Iran, Iraq, Japan, Japanese Mandated Islands, Korea, Kwangtung Leased Territory, Manchukuo, Portugal (including Madeira, the Azores and the Cape Verde Islands), Rio de Oro, Spain (including the Canary Islands and the Spanish Zone of Morocco), Tangier Zone, Turkey, including the Hatay, or to any port or destination in the Union of Soviet Socialist Republics not on the Black Sea, Baltic Sea, or Arctic Sea.

Credit Services, Ltd.

The November *Electrical Contractor* states that Credit Services, Ltd., has presented a favourable report upon its past year's activities. The company was founded about three years ago for the purpose of extending credit to members of the Electrical Contractors' Association engaged in hire-purchase business; Mr. L. C. Penwill, Director and Secretary of the E.C.A., is a director of the company.

When war broke out it was feared by some of the shareholders, all of whom are necessarily E.C.A. members, that there would be losses due to hirers being called to the colours and for other reasons arising out of war conditions being unable to pay. This has proved not to be the case. Although payments in arrear amount to about 1 per cent. of the total transactions since the company commenced business, the actual loss due to bad debts has amounted to less than £5. This is said to be a far better result than was bargained for when the original proposition was laid before the membership. The capital is small, being only some £7,000, much less than was originally anticipated, but the war has rendered it inadvisable to extend either capital or transactions at present. "In the meantime, the fact that the capital is being fully utilised and is returning a net profit month by month, is evidence that the shareholders have made no mistake in their investment and that there is still a profit to be earned from hire-purchase accounts."

Electrical Plant for Capetown

The London representative of the South African Electricity supply Commission (Mr. G. A. Jenkin) has written to the *Chamber of Commerce Journal* denying the accuracy of a report published in the October issue of our contemporary that "the electrical engineer to the Capetown City Council was proceeding to America to place orders for the full equipment of a power station just outside Capetown for the Electric Supply Commission for which he is the local manager."

Priority in the United States

The *Electrical World* reports that the United States Navy Department has "paved the way" for invoking the priority powers bestowed by the Conscription Act to obtain turbines and boiler equipment where any private orders get in the way of its "two-ocean" shipbuilding programme. Warships now under construction will require upward of 8,000,000 HP of turbine capacity. Construction schedules call for the completion of the entire fleet in 1946 which means that the turbines must be available considerably in advance of that time.

United States and the Purchase Tax

The Board of Trade is informed that the requirements of the United States Customs for the completion of invoices covering merchandise, subject to the Purchase Tax, will be as follows:—

State whether or not the merchandise is chargeable with Purchase Tax under the British Finance (No. 2) Act, 1940, when bought under a chargeable purchase. If it is, state whether or not such or similar merchandise is currently being sold or freely offered for sale for home consumption. Where such merchandise is not offered for sale for home consumption, state the reasons, e.g., "no such or similar merchandise manufactured in the United Kingdom except for export;" or alternatively in cases where the merchandise is not freely offered, give a complete description of any restriction as to use, disposition, or resale of such or similar merchandise, or other relevant particulars.

If the merchandise is chargeable with Purchase Tax, and if such or similar merchandise is sold or freely offered for sale for home consumption, state the selling price per unit, including taxes, for such or similar merchandise when sold or freely offered for sale in the usual wholesale quantities for home consumption.

Such information is required in respect of all goods leaving England on or after October 21st. It will be advisable to send a duplicate set of invoices bearing the additional information to facilitate the task of the importer, if the original invoices do not contain the required details.

Lamp Publicity

A new advertising figure for lamps has made his debut in the provincial newspapers; he is "Mr. Bright" of Blackpool, or Manchester, of Birmingham, or wherever the "Ekco" film campaign is being featured. Space is being reserved for this latest phase of the comprehensive "Ekco" lamp scheme, details of which have already been outlined in these pages. The "Ekco" lamp film featuring Claude Hulbert, Hay Petrie and Luanne Shaw is being shown in cinemas throughout the country with marked success.

Extensive Osram lamp advertising is again to be carried out by the General Electric Co., Ltd., during this winter. The company will use the London daily and evening papers, the Provincial Press and industrial and trade journals. The theme of the campaign will be "Light up and Smile," advocating the proper illumination of the house to counteract war depression. Special treatment will be accorded to the company's automobile lamps.

Fatalities

The death occurred last week of a Dartford paper maker named George R. Shirley while fixing a metal table lamp in an air-raid shelter. His wife, who went to his rescue, received a severe shock but succeeded in breaking the wire.

Another case of the same kind is reported from Easington (co. Durham) when a boy was killed while carrying out an extension to a shelter. An electrician stated at the inquest that the wires had not been properly connected. They had been bared practically to the top of a lampholder and one of the wires being loose in its terminal had touched the casing rendering it "alive."

An inquest was held recently into the death of two aircraftmen from electric shock. The evidence showed that the men were engaged in removing the wreckage of a German bomber when a mobile crane which they were using made contact with an overhead distribution line. The Coroner recorded a verdict of "Accidental death." A third man who was working with them also received a shock but was able to leave the hospital after treatment.

Johannesburg Appliance Scheme

The Johannesburg Electricity Department has been devising ways and means of increasing the consumption of electricity within the municipal area, notably by selling electric stoves and other electrical household appliances on a hire-purchase system through its retail division. In reporting this development Mr. J. C. Britton, Assistant Trade Commissioner at Johannesburg of the Canadian Government, pointed out that sales of stoves had declined by at least 50 per cent. in Johannesburg compared with a year ago and had also decreased, although less drastically, in Cape Town, Durban and Port Elizabeth. He ascribes the decline in part to extreme quietude in the building and allied industries, and to the stoppage of sales to men enlisting in the Forces. It appears, too, that in connection with all hire-purchase business more careful methods of investigation have been adopted.

It is considered that a return to normal conditions will bring about a rapid improvement in the building and allied trades particularly in Johannesburg and vicinity. Therefore, the terms of the scheme of the Johannesburg Electricity Department will be of interest. Briefly, the Department will purchase a limited number of electric stoves and other electrical appliances from "stockists," add, say, 10 per cent. to the cost and sell them on extended hire-purchase conditions. Consumers must pay 10 per cent. as a "down payment," the balance being spread over a three-year period at a nominal rate of interest.

Critics of the scheme maintain that it would be difficult to operate a hire-purchase business profitably on such a small "mark-up." As, moreover, only a small number of the stoves marketed will be stocked by the Electricity Department, many dealers will suffer, rather than gain, by the adoption of the scheme.

It is clear from the report that Mr. Britton hopes that Canada will retain the 70 per cent. share of the trade which it has enjoyed during the past four years. He points out at the same time that electric stoves have been produced in South Africa during that period; they have been rapidly gaining ground in quality although they are not yet up to overseas standards. Cooking ranges of local make are, however, quoted £10 below the price of the imported article. Castings, rather than steel plate, are used in their construction.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted: F. Fradley, Ltd., Stoke-on-Trent; S. E. Grubb, East Ham; Higgins & Cattle, Ltd., London, W.1; Percy Hubbard, Prestwich, Lancs, and H. F. Ward, Ltd., Sparkhill, Birmingham. At the same meeting one application was withdrawn.

New Catalogues and Lists

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—Leaflet "Sirocco Introduces a New Address," dealing with the establishment of a new depot at Briggate House, Albion Place, Leeds, 1.

Cooper Roller Bearings Co., Ltd., King's Lynn, Norfolk.—Priced and illustrated catalogue, containing technical information and data, with load-carrying tables based on an estimated life of twenty years for bearings of the split roller type.

Quasi-Arc Co., Ltd., Bilston, Staffs.—Technical circular (TC. 181) describing Type "FW" single- and multi-operator transportable transformer welding equipment.

Watson & Sons (Electro-Medical), Ltd., 76, Castle Street, Reading, Berks.—Illustrated technical publication (No. 214) dealing with the "Röntgen II" two-valve high-voltage generator for energising two diagnostic X-ray tubes with up to three foci.

G. Turnock, Ltd., 41 High Street, Aston, Birmingham.—List No. 251040 giving revised prices of "Tunion" bakelite accessories.

Harcourts, Ltd., Stanhope House, Kean Street, London, W.C.2.—Priced leaflet (H.45) illustrating the standard range of "Harfleur" fittings for 80-W fluorescent 5-ft. tubular lamps, general purpose pendants and commercial types.

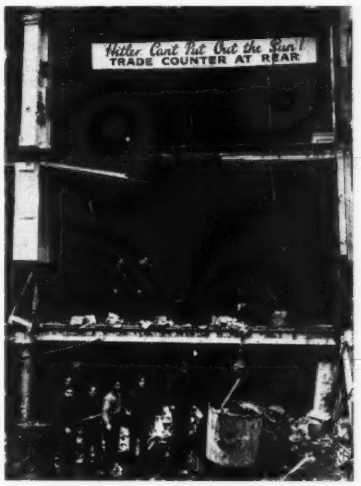
Calendar

Mr. Christopher Wade, of Gabriel Wade & English, Ltd., has sent us a calendar for 1941 which bears a charming picture of a suntanned maiden.

Trade Announcements

Bulpitt & Sons, Ltd., inform us that they are unable at present to accept any further orders for their hollow-ware and electrical departments. A further announcement will be made later and in the meantime they ask customers to send any amounts due without waiting for statements.

Brown Brothers, Ltd. (Birmingham Branch) advise us that it has been necessary to establish offices at Dawlish Road, Selly Oak, Birmingham, to which all inquiries should be addressed. In the near future full stocks and their usual services will be



In spite of this the Sun Electrical Co., Ltd., has kept going and orders are being attended to as usual

available from this address, but in the meantime traders are asked to post their orders to Fryer Street, Wolverhampton.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

MULTIWARM heating pads.

SPEED KING hair dryer.

Trade Mark Applications

AMONG recent applications for British trade marks are the following, objections against any of which may be entered within one month of November 6th:

ODEON. No. 587,016. Class 13 (III). Electric light fittings, advertising display frames, ash trays, music stands and supports for loud-speakers, all being goods of ordinary metal. The Parlophone Co., Ltd., 102, Clerkenwell Road, London, E.C.1.

VIBRAPACK. No. 612,440. Class 9 (IV). Electric power supply transformers. P. R. Mallory & Co., Inc., 3029 East Washington Street, Indianapolis, Indiana, U.S.A.

SUNBEAM (design). No. 611,257. Class 11 (IV). Electric toasting stoves and electric grills. Chicago Flexible Shaft Co., 5600, Roosevelt Road, Chicago, Illinois, U.S.A.

UNITED STATES EXPORT TRADE

Analysis of Destinations of Electrical Goods and Machinery

ALTHOUGH the annual statement of the foreign trade of the United States is late in appearing, the very full details it gives of the countries participating in that trade justify the time taken in its compilation and issue. In the accompanying table, which is based on the official returns for 1938, an attempt has been made to select some of the more noteworthy items and outlets of electrical exports in that year. Notes of increases or decreases compared with 1937 are added for purpose of comparison. The total value of the trade was $102,151,000, a decrease of $10,500,000 on 1937. It will be seen that the decline spread through most of the leading groups, including radio material and refrigerators, but that there were again increases in the shipments of washing machines and electric razors during the year.

With regard to destinations, it is noteworthy that while the South American countries stand out as customers for United States electrical goods, certain British Empire markets are fairly prominent also. It may be added that the total electrical trade of the United States in 1939 rose in value by about $3,150,000 on 1938. No details of destinations are, however, yet available.

	1938 $000	Inc. or dec. on 1937 $000
Generators, DC—		
Total	358	−154
To Canada	71	− 49
„ Mexico	32	− 11
„ Colombia	32	+ 13
„ Venezuela	49	+ 48
Generators, AC—		
Total	691	−414
To Brazil	182	+ 38
„ Venezuela	50	− 1
„ Japan	67	+ 67
Steam turbine generator sets—		
Total	1,382	+948
To Canada	89	+ 27
„ Brazil	155	+145
„ Venezuela	565	+552
„ Dutch West Indies	359	+359
Accessories and parts for generators—		
Total	650	+ 60
To Canada	117	+ 3
Arc-welding sets—		
Total	1,069	+ 9
To Venezuela	55	+ 2
„ Argentina	59	− 5
„ Canada	124	− 52
„ United Kingdom	149	− 47
„ Soviet Russia	29	+ 25
„ Iran	185	+104
Self-contained lighting outfits—		
Total	1,452	−309
To Brazil	78	− 8
„ South Africa	105	−141
„ Venezuela	130	+ 26
„ Canada	80	− 24
„ Argentina	61	−186
„ Japan	277	+158
Batteries, 6 and 12 V, storage—		
Total	1,487	−342
To South Africa	246	− 86
„ Colombia	63	+ 10
„ India	123	− 72
„ Mozambique	58	− 4
„ Venezuela	82	+ 13
„ Hong Kong	53	—
Other storage batteries—		
Total	708	−302
To Canada	82	+ 13
„ South Africa	53	−220
„ India	68	+ 36
„ United Kingdom	227	+122
No. 6 dry-cell batteries—		
Total	169	− 60
To Argentina	27	− 36
„ Newfoundland	19	—
Flashlight batteries—		
Total	1,976	−837
To Argentina	40	−213
„ Colombia	259	+ 47
„ India	462	−363
„ Malaya	166	− 47
„ Siam	58	− 74
„ Burma	131	*
Radio B & C dry batteries—		
Total	314	−197
To Argentina	179	− 72
„ Netherlands Indies	17	+ 1
Other wet and dry primary batteries—		
Total	173	− 16
To Canada	35	+ 13
„ South Africa	16	− 17
Power transformers, 500 kVA and over—		
Total	443	+ 6
To Brazil	215	− 4
„ Venezuela	103	+ 72
Distribution transformers, less than 500 kVA—		
Total	722	+ 73
To Mexico	53	− 66
„ Venezuela	124	+ 21
„ Colombia	80	+ 28
„ South Africa	47	+ 41
Instrument transformers—		
Total	136	+ 14
To South Africa	27	+ 9
„ Brazil	21	+ 3
Other transformers—		
Total	462	+ 40
To Canada	52	− 15
„ Mexico	50	− 24
„ South Africa	41	− 13
„ Brazil	47	+ 16
Double current and motor generators, converters, &c.—		
Total	755	+ 69
To Peru	69	+ 58
„ Canada	79	− 9
„ Soviet Russia	121	+ 70
„ Japan	100	+ 35
„ Belgian Congo	84	+ 83
Switchboard panels, except telephone—		
Total	637	+ 77
To Venezuela	129	+ 76
„ Australia	49	+ 38
„ Canada	65	+ 5
Power switches and circuit-breakers over 10 A—		
Total	1,802	+310
To Canada	237	−113
„ Mexico	99	− 71
„ South Africa	80	− 58
„ Brazil	486	+290
„ Venezuela	136	+ 79
Watt-hour and other measuring meters—		
Total	573	−199
To Mexico	35	− 65
„ Brazil	47	+ 13
„ Soviet Russia	51	+ 39
Indicating instruments—		
Total	869	+ 61
To United Kingdom	202	+102
„ Hong Kong	64	+ 52
„ Canada	152	− 19
Recording instruments—		
Total	284	− 57
To Soviet Russia	63	+ 49
Other testing apparatus—		
Total	1,321	+ 94
To Canada	423	− 35
„ Soviet Russia	94	+ 63
„ Australia	93	+ 1
„ United Kingdom	129	+ 16
Lightning arrestors, choke coils, &c.—		
Total	696	+ 56
To South Africa	50	+ 22
„ India	35	− 32
„ Canada	76	− 37
„ Brazil	154	+100
Motors, ½ HP and under—		
Total	779	−102
To United Kingdom	71	− 26
„ Canada	279	− 30
„ Australia	90	+ 49
Motors, over ½ HP and under 1 HP—		
Total	273	− 72
To Argentina	23	− 15
„ Canada	81	− 19
„ Colombia	29	+ 9
Stationary motors, 1–200 HP—		
Total	1,481	−358
To Canada	193	− 80
„ Mexico	111	−151
„ South Africa	73	− 56
„ Soviet Russia	23	+ 8
„ Argentina	65	− 20
„ Australia	50	− 19
Stationary motors, over 200 HP—		
Total	499	+216
To South Africa	67	+ 19
„ Soviet Russia	123	+115
„ Japan	63	+ 63
Railway motors—		
Total	158	−147
To South Africa	127	−121
Electric locomotives, railway, mining and industrial—		
Total	752	− 48
To Canada	182	+ 60
„ South Africa	195	+133
„ India	59	+ 19
„ Australia	82	+ 35
Electric trucks—		
Total	409	+149
To Soviet Russia	119	+109
Starting and controlling equipment for railway and vehicle motors—		
Total	235	− 29
To Soviet Russia	15	− 7
„ South Africa	103	− 5
Ditto, for industrial motors—		
Total	1,395	−150
To Canada	451	−120
„ Mexico	53	− 84
„ South Africa	63	+ 15
To Soviet Russia	81	− 16
„ United Kingdom	96	− 67
Portable electric tools—		
Total	1,335	+103
To United Kingdom	301	+ 26
„ Canada	256	− 30
„ Soviet Russia	206	+156
Accessories and parts for motors—		
Total	1,614	−319
To Canada	381	−112
„ United Kingdom	249	−178
Household refrigerators—		
Total	10,768	−1,987
To Canada	677	−367
„ United Kingdom	689	−101
„ South Africa	1,707	−635
„ Mexico	158	−431
„ Brazil	995	− 40
Commercial refrigerators, up to 1 ton—		
Total	1,914	−574
To United Kingdom	155	−403
„ Canada	158	− 42
„ South Africa	104	− 6
Electric fans—		
Total	646	+ 24
To Canada	109	− 11
Incandescent lamps for automobiles, flashlamps, &c.—		
Total	359	− 90
To India	61	− 54
Other metal filament lamps—		
Total	886	−164
To Argentina	76	− 38
„ Canada	89	+ 19
Other electric lamps—		
Total	87	+ 38
To Canada	29	+ 19
Household washing machines—		
Total	2,629	+528
To Canada	491	− 14
„ United Kingdom	695	+193
„ South Africa	557	+212
Domestic vacuum cleaners—		
Total	559	+ 30
To Canada	144	+ 40
„ United Kingdom	263	+ 24
Flat-irons—		
Total	319	− 23
To United Kingdom	55	+ 24
„ Canada	45	+ 18
Cooking ranges—		
Total	350	− 50
To Canada	46	+ 14
„ Colombia	55	+ 13
Electric furnaces, &c.—		
Total	2,107	+1,271
To Soviet Russia	1,510	+1,357
X-ray Apparatus, &c.—		
Total	1,250	− 76
To Canada	263	− 13
„ Mexico	57	− 43
„ United Kingdom	167	− 7
„ Argentina	70	− 2
Radio transmitting sets, valves and parts—		
Total	2,958	+274
To Mexico	136	− 60
„ Brazil	72	− 3
„ Canada	247	− 9
„ Colombia	209	+121
„ Soviet Russia	105	− 95
„ Norway	180	+155
„ Hong Kong	417	+360
Receiving valves—		
Total	2,973	−1,091
To Brazil	167	− 27
„ Canada	221	− 54
„ Argentina	494	−210
„ Australia	147	− 64
„ New Zealand	157	− 35
Receiving sets—		
Total	10,554	−5,575
To Chile	385	+188
„ Colombia	394	+336
„ Venezuela	403	+ 93
„ United Kingdom	738	−421
„ Mexico	711	−1,674
„ Brazil	1,192	−590
„ South Africa	1,552	−392

(*Continued at foot of next page*)

ELECTRICITY SUPPLY

"Nesco" Assessment Dispute. Swansea Meter Reading Economy

Blackpool.—SWITCHGEAR MODIFICATION.—The rupturing capacity of switchgear is to be increased at a cost of £4,000.

Cheltenham.—UNDERTAKING'S PROFIT.—A net surplus for the past year of £8,774 is reported by the Electricity Committee.

Coventry.—MAINS EXTENSIONS.—Application is being made by the Electricity Committee for sanction to borrow £10,000 for mains extensions.

Durham.—"NESCO" ASSESSMENT.—The Valuation Committee has informed the County Council that efforts to reach an amicable settlement by negotiation concerning the assessment of the undertakings of the North-Eastern Electric Supply Co., Ltd., have been unsuccessful, and the company is to appeal against the assessment at the Quarter Sessions. The Committee has agreed to an extension of time within which the appellants will be required to lodge their statements of case to December 2nd. It states that every effort will still be made to reach a just settlement by negotiation.

Ilford.—AIR-RAID SHELTER INSTALLATIONS.—The Emergency Committee has arranged for the Electricity Department to provide shelter lighting at a cost of £25 3s. each for 29 shelters and £20 14s. each for another 29.

LOANS.—The Electricity Committee has obtained sanction to borrow £4,000 for switchgear, £3,778 for mains and £2,123 for cable diversions.

Lancashire.—SHELTER LIGHTING.—Electric lighting is to be installed in school shelters in the Liverpool area by the County Education Committee.

HOSPITAL INSTALLATION.—The County Health Committee has decided to renew the electrical installation at Ormskirk Hospital which is 34 years old. The cost is estimated at £3,500.

U.S. Export Trade

(*Concluded from previous page*)

	1938 $000	Inc. or dec. on 1937 $000
Receiving set components—		
Total	5,413	−2,050
To Argentina	1,094	−263
„ Canada	1,044	−391
Loudspeakers—		
Total	680	−208
To Canada	210	− 65
„ Argentina	130	− 13
Other receiving set accessories—		
Total	524	−357
To United Kingdom	55	− 2
„ Canada	131	+ 22
Electric razors—		
Total	1,059	+862
To United Kingdom	553	+532
„ Canada	249	+ 99
Telegraph apparatus—		
Total	343	−160
To Canada	116	− 81
„ Soviet Russia	50	− 16
Telephone instruments—		
Total	180	− 81
To Venezuela	26	+ 12
Other telephone equipment—		
Total	3,555	+534
To Canada	798	−409
„ Colombia	58	+ 40
„ Brazil	1,163	+742
„ Australia	330	+ 8
Insulating material—		
Total	304	−108
To Canada	81	− 74
Metal conduit and switchboxes—		
Total	900	−183
To Brazil	143	− 3
„ Colombia	71	+ 25
„ Argentina	26	− 40
„ Mexico	43	− 84
„ Canada	111	− 20
Lighting switches, sockets, &c.—		
Total	1,217	+196
To Canada	318	+ 65
„ United Kingdom	294	+212

Lancaster.—RESULT OF YEAR'S WORKING.—The city treasurer's annual report shows that the gross profit on the Electricity Department during 1939-40 was £57,838 against £89,999 in the previous year. The net profit was £14,340 (against £21,014 in the previous year).

Liverpool.—PLANT EXTENSIONS.—The City Council has approved a recommendation of the Electric Power and Lighting Committee to make application for consent to proceed with certain proposed extensions to generating plant, to renew plant at a substation, to carry out building operations and to rearrange high-voltage cables entering the substation, at an estimated total cost of £1,138, and to install three high-voltage cubicles and one 750-kVA transformer in a substation and to extend low-voltage cables at a total estimated cost of £1,225.

London.—ST. MARYLEBONE.—The Emergency Committee is to provide lighting, &c., at private air-raid shelters at an estimated cost of £2,470.

Rochdale.—JOINT METER READINGS.—The Town Council has approved a report prepared by the gas and electrical engineers and the borough treasurer, on joint meter readings. It was estimated that there would be a consequent saving of £650 per annum. One councillor stated that while the Gas Department was prepared to work wholeheartedly in this matter of joint meter readings he could not pay the same compliment to the Electricity Department. Electricity meter readers, he said, were apparently some sort of superior engineers—gas meter readers were not to be compared with them—but he, personally, had never found an electricity meter reader who did any more than inspect the meter.

Stirling.—DEPOSIT BEFORE RECONNECTION.—At Stirling County Council's last meeting the question was raised of an electricity company asking a Council tenant for a deposit of £2 5s. before reconnecting the supply, which had been cut off through the tenant falling into arrears with his account. The arrears had now been paid off. It was agreed that the county clerk should take the matter up with the M.P. for East Stirling and Clackmannan.

Stone.—PRICE INCREASE.—The price of electricity is to be further advanced from January 1st. Instead of 12½ per cent. the increase will be 15 per cent.

Stretford.—INSTALLATIONS IN SHELTERS.—The question of lighting and heating air-raid shelters has been considered by the Emergency Committee, which has asked the Stretford and District Electricity Board to prepare detailed estimates.

Swansea.—FEWER METER READINGS.—The borough electrical engineer recently reported to the Electricity Committee that accounts for electricity supplied to tenants of Corporation property are rendered every June and December, whereas the meters are read quarterly. In view of the half-yearly rendering of accounts this was unnecessary and he had accordingly given instructions to omit taking the readings in the March and September quarters. He also reported that in view of the present war conditions it had been considered unnecessary to read the meters in the June quarter of consumers taking supplies under the rateable value tariff.

Torquay.—LOAN FOR DOMESTIC APPARATUS.—Application is being made by the Electricity Committee for permission to borrow £2,000 for cookers and other apparatus for hire.

Overseas

Australia.—TRANSMISSION SCHEME HELD UP.—The *Electrical and Radio Trader* reports that the construction of power transmission lines between Sydney and Newcastle power-house has been held up because the State Government has not the money available to proceed with the work. The line has been taken from Sydney as far as Hawkesbury at a cost of about £100,000, but will stop at Gosford. It is estimated that a further £100,000 will be required before the work is completed. The construction of the power line was undertaken to ensure a supply of power to the heavy industries at Newcastle and to centres between Gosford and Taree in the event of an interruption of the supply from the Zara Street power-house at Newcastle.

Canada.—ST. LAWRENCE PROJECT.—It was recently announced in Ottawa that following a conference between Canadian and United States committees of technical experts an agreement had been reached about the engineering and other investigations which are the necessary preliminary to the development of the International Rapids section of the St. Lawrence River between Morrisburg and Cornwall.

Our Montreal Correspondent points out that no pact or agreement has been made between the two countries, but there is, at least, a "gentlemen's agreement." Washington has intimated it is prepared to give priority to the immediate power needs of Ontario and Quebec for munitions purposes, and the new inquiry into power resources in the St. Lawrence River is the polite method of deferring definite action on the sea project embodied in the last draft treaty submitted to Canada by the U.S. Secretary of State two years ago. The St. Lawrence waterway development has been the subject of long and repeated negotiations between the two countries. Hitherto the tendency has been to emphasise the navigation aspect. The project, as it was generally conceived, was to provide a deep-draught ship channel from Montreal to the head of the Great Lakes and incidentally to develop large quantities of hydro-electric power.

The great power development possibilities lie in the International Rapids section which extends roughly from Kingston to Cornwall, Ont. Engineers estimate that 2,000,000 HP may be obtained by harnessing the waters in that area. Under a joint development arrangement, half of this would go to Ontario and half to the United States. One plan for developing this power involved two dams, each with locks and power houses. One was to be at Chrysler Island, near Morrisburg, where a 24-ft. head of water would be obtained, and the other at Barnhart Island, near Cornwall, which would provide a 60-ft. head.

The navigation side of the subject has been partly developed already. The Welland Canal links Lakes Ontario and Erie with a deep ship channel. The Beauharnois canal, just above Montreal, was built to waterway standards by the Beauharnois Co. as a condition to the securing of a licence to divert water from the river for power purposes. These works are wholly in Canadian territory.

Mexico.—AMERICAN POWER PLANT.—The new generating station to be established at Ixtapantongo, near Mexico City, is to be equipped with machinery that is to be

purchased in the United States, for which purpose the Mexico Government has decided to authorise the expenditure of ten million pesos.

Russia.—USE OF ELECTRICITY RESTRICTED.—A *Reuter* message from Moscow states that the Moscow Soviet has passed a resolution limiting the use of electricity. Lamps in the main streets must not be of more than 500 W and in smaller streets not above 200 W. Parks and stadiums must reduce their consumption by 15 per cent. compared with the 1939 figures and the tramway trust by 3 per cent.

MOBILE GENERATING SETS.—The Commissariat of the Building Industry of the U.S.S.R. is constructing 1,000 mobile generating sets for use in timber camps and on railway construction jobs.

United States.—EXTENSION OF DELRAY STATION.—A 75,000-kW, 1,800-RPM turbo-alternator ordered for installation late next year at the Delray generating station of the Detroit Edison Co. will be similar to the two existing sets laid down in 1938 and 1939. It will be of the single-casing, single-flow type operating with steam conditions of 815 lb. per sq. in. (gauge) and 900 deg. F. and 1 in. abs. back pressure. The alternator will be a 100,000-kVA machine with stator wound for 14,400 V.

TRANSPORT

Blackpool. — FLASHING ON OVERHEAD LINES.—The transport manager (Mr. W. Luff) reports that 600 screens have been used on the tramway system to obscure flashes, and that a further 1,500 are to be fixed. The screens are being made to his plans by a local firm. Drivers have instructions to cut off power when approaching these points so that the trolley wheel glides over.

London.—FIRST TUBE.—The first "tube" railway of the Metropolis was fifty years old last Monday (November 4th). The former City and South London Railway then had four stations, at the Borough, the Elephant, Kennington and the Oval. It was operated by electric locomotives, each of which hauled three cars capable of accommodating 32 passengers each. They were known as "padded cells," being completely upholstered and windowless. The line is now part of the "Northern" route of the London Passenger Transport Board.

MEDALS FOR BRAVERY.—The London Passenger Transport Board is to institute a medal for members of its staff who display conspicuous bravery in discharge of their duties.

Newcastle-on-Tyne.—LOSS ON TRANSPORT UNDERTAKING.—A preliminary report submitted to the Transport and Electricity Committee by Mr. T. P. Easton, the general manager, shows a deficit of £3,942 for the past year on the undertaking, which comprises trams, trolley-buses and motor buses. The revenue totalled £823,369, a decline of £3,648. During the year the undertaking contributed £20,000 towards the relief of rates.

Reading.—TROLLEY-BUS EXTENSIONS.—When the Council decided to institute the trolley-bus services which have proved so popular and profitable, powers were obtained for a trolley-bus mileage considerably greater than has so far been provided. The proposals have recently been reviewed, but it has been decided that the scheme should be postponed for carrying out at an appropriate time in the future.

Switzerland. — MORE TROLLEY-BUSES.—The municipal tramways department of Zurich has recently replaced the petrol buses on a two-mile route by six trolley-buses. The vehicles have seating accommodation for 26 passengers and standing room for 42. The doors are electro-pneumatically operated from the driver's seat.

RADIO AND TELEPHONY

India.—NEW RADIO TRANSMITTER.—A *Reuter* message from Simla states that a 100-kW transmitter is to be built for All-India Radio to counteract enemy propaganda. The new transmitter, which will cost £135,000, is intended to transmit broadcasts not only to European countries but also to Africa, the Far East and the Middle East.

Spain.—RECONSTRUCTION OF TELEPHONE SERVICE.—According to the *Journal des Telecommunications*, work is at present in progress throughout Spain on the reconstruction of the telephone lines which were destroyed during the civil war. It is stated that during last year nearly 100,000 new telephones were installed and about 76,000 old instruments replaced by new ones. Forty-four Spanish towns with 54 exchanges —about 76 per cent. of the country's total— are said to be now arranged for automatic operation and it is expected that by the end of next year there will be as many automatically operated exchanges in use as existed before the civil war.

The Waterloo-City Railway

Modernisation Scheme

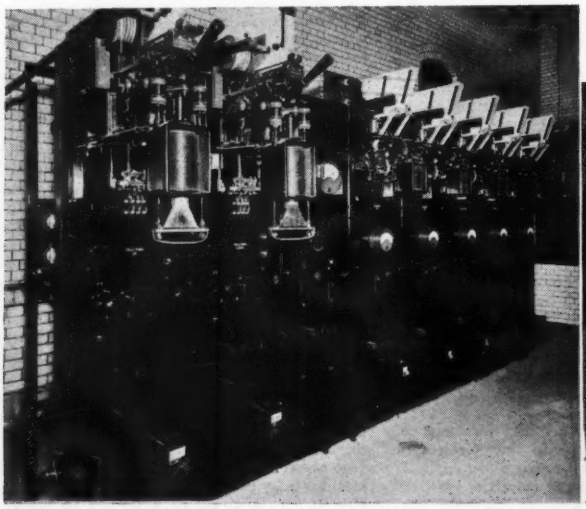
WE reported last week that the railway running between the Waterloo Station of the Southern Railway and the City (Bank station) was re-opened for traffic on October 28th after modernisation.

The line is 1 mile 46 chains in length and part of the scheme has been the welding of the running rails into 315-ft. lengths (544 welded joints) to reduce noise. At the same time the conductor rail has been moved to the standard position and 6,445 yd. of new rail laid. New lighting has been installed and colour-light signalling introduced.

The new rolling stock comprises twelve motor coaches and sixteen trailer coaches which are formed into five-coach trains each capable of accommodating 1,312 passengers. The railway carries an average of about 30,000 passengers daily—mainly during the rush hours. Lighting has been given special consideration and specially-designed fittings have been employed. Normally the lighting is taken from the 600-V traction supply, but there is a "Nife" emergency battery in each coach.

The control equipment is of the most modern design and is similar to, and largely interchangeable with, that used on the latest suburban and express units of the Southern Railway. The doors are electrically controlled by the guard and telephone communication is provided between the motorman and guard and a tunnel telephone hand set is also carried in each driving cab for emergency use, the set being clipped to bare wires running through the tunnel.

It is stated that nearly 40,000 yd. of cables and wires have been installed in connection with the improvements.



Left: The main Waterloo-City Railway switchboard. Right: Pump starter panels controlling remote pumps at sumps for drainage water.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

5639. "Glow-discharge apparatus." T. Rummel. March 16th, 1939. (Convention date not granted.) (527899.)

25079. "Television apparatus." R. B. Poole. July 15th, 1939. (527967.)

37931. "Electric-discharge tube." P. Meisel. December 30th, 1938. (527901.)

1939

1107. "Automatic frequency-control systems." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and O. E. Keall. January 12th, 1939. (527968.)

1108. "Frequency selective circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and E. F. Goodenough. January 12th, 1939. (527902.)

3308. "Telephone exchange systems." Standard Telephones & Cables, Ltd., E. P. G. Wright, L. P. Lowry and G. E. Peters. January 31st, 1939. (527696.)

3311. "Wave transmission systems for television incorporating channels utilising pulse modulation." Kolster-Brandes, Ltd., and W. A. Beatty. January 31st, 1939. (527904.)

3519. "Manufacture of electric cables." J. C. Swallow, M. W. Perrin and Imperial Chemical Industries, Ltd. February 2nd, 1939. (527763.)

4513. "Method of and means for applying electrical impulses to living bodies." E. Ellis. February 11th, 1939. (527831.)

4578. "Moulding of articles from synthetic resins." Ebonestos Industries, Ltd., and A. Amigo. February 11th, 1939. (527906.)

4689. "Electric converting systems." British Thomson-Houston Co., Ltd. February 12th, 1938. (527701.)

4690. "Liquid blast electric circuit-breakers." British Thomson-Houston Co., Ltd. February 12th, 1938. (527702.)

4724. "Method of and apparatus for opening or closing an electrical circuit at any predetermined point in the cycle of an alternating current or potential therein." R. S. Silver, and Imperial Chemical Industries, Ltd. February 13th, 1939. (527703.)

4860. "Control of synchronous alternating-current electric motors." General Electric Co., Ltd., and G. W. Watson. February 14th, 1939. (527909.)

8161. "Means for obtaining colour effects on lighting fittings." G. D. Skinner and Benjamin Electric, Ltd. March 14th, 1939. (527766.)

8208. "Electric remote-control systems." British Thomson-Houston Co., Ltd. March 14th, 1938. (527768.)

8374. "Systems for televising or producing a photographic record of a scene." C. O. Browne. March 16th, 1939. (527912.)

8446. "Bases for electric lamps." British Thomson-Houston Co., Ltd. March 17th, 1938. (527914.)

8610. "Automatically variable audio-correction circuits for wireless receivers and the like." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust, J. D. Brailsford, A. L. Oliver and J. F. Ramsay. March 17th, 1939. (Divided out of 522476.) (527915.)

9043. "Means for facilitating the synchronisation of machines." Record Electrical Co., Ltd., and W. H. Lawes. March 22nd, 1939. (527706.)

9844. "Magnetic separators." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 1st, 1938. (527771.)

10524. "Testing electrical circuits." Standard Telephones & Cables, Ltd. (W. Hatton and L. Kozma). April 4th, 1939. (527836.)

11111. "Electrical rectifiers of the copper oxide type." Westinghouse Brake & Signal Co., Ltd. January 7th, 1939. (527714.)

11356. "Electric regulators." Westinghouse Electric International Co. April 23rd, 1938. (527839.)

11421. "Current collectors for trolley-buses and other electric vehicles supplied from overhead wires." F. Szalay. July 2nd, 1938. (527733.)

11428. "Insulated electric cables." Standard Telephones & Cables, Ltd., T. R. Scott, J. K. Webb and J. F. Morley. April 14th, 1939. (527734.)

11429. "Electric resistances." Standard Telephones & Cables, Ltd., H. Wolfson and L. J. Harris. April 14th, 1939. (527735.)

11507. "Direct-current arc welding generators." Wilson Welder and Metals Co., Inc. April 16th, 1938. (527782.)

11512. "Coin-actuated mechanism." Westinghouse Brake & Signal Co., Ltd., R. E. Stickley and S. M. Dixon. April 15th, 1939. (527783.)

11569. "Synchronous dynamo-electric receivers and transmitters." A. Josifian, and D. Svecharnik. April 17th, 1939. (527976.)

11629. "Electron multipliers." F. J. G. Van Den Bosch, and Vacuum-Science Products, Ltd. April 17th, 1939. (528978.)

11658. "Cathode-ray tubes." A. F. Pearce. April 18th, 1939. (527980.)

11771. "Navigation-aiding radio beacon systems." Marconi's Wireless Telegraph Co., Ltd., and R. J. Kemp. April 19th, 1939. (527841.)

11784. "Resilient ring elements and means for making same." Budd Induction Heating, Inc. April 23rd, 1938. (Cognate application 11785/39). (527842.)

11798. "Electric motor control systems." British Thomson-Houston Co., Ltd. April 21st, 1938. (527928.)

11855. "Variable electric resistances or potentiometers." B. J. Edwards, D. Jackson and Pye, Ltd. April 19th, 1939. (527745.)

11863. "Prepayment mechanism for gas, electricity, and like meters." G. Wilson Gas Meters, Ltd., J. H. Wilson and D. C. E. Poole. April 20th, 1939. (527748.)

11870. "Electric light fittings." Co-operative Wholesale Society, Ltd., and R. H. Line. April 20th, 1939. (527750.)

11874. "Means for conveying metallic articles through electro-plating or like apparatus." C. F. Neale and J. Kronsbein. April 20th, 1939. (527751.)

11918. "Electric circuit arrangements comprising thermionic valves." General Electric Co., Ltd., and W. H. Aldous. April 20th, 1939. (527795.)

11920. "High pressure metal vapour electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). April 20th, 1939. (527796.)

11931. "Method of making number drums or rollers for counting mechanisms, more especially for electricity measuring apparatus." Landis & Gyr Akt.-Ges. August 26th, 1938. (Addition to 512,385.) (527800.)

11955. "Apparatus adapted to be supplied by a vibrator from a direct-current supply." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 23rd, 1938. (527806.)

11996. "Electrically heated boiler." Martin's Cultivator Co., Ltd., and T. M. Jones. April 21st, 1939. (527817.)

12008. "Cathode-ray tube." Radioakt-Ges. D. S. Loewe. April 22nd, 1938. (527843.)

12017. "Electrical insulating materials." Pirelli-General Cable Works, Ltd., and B. O. Ashford. April 21st, 1939. (527844.)

12045. "Gaseous or vapour electric-discharge lamps." British Thomson-Houston Co., Ltd. April 22nd, 1938. (527853.)

12047. "Electric-discharge lamps comprising material adapted to be excited to luminescence by the electric discharge." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). April 21st, 1939. (527854.)

12077. "Reciprocating mechanisms particularly applicable to switches for the control of electric spot welders." Igranic Electric Co., Ltd. May 2nd, 1938. (527860.)

12110. "Electron multipliers." Marconi's Wireless Telegraph Co., Ltd. April 30th, 1938. (527870.)

12112. "Cathode-ray tubes suitable for television reproduction." Marconi's Wireless Telegraph Co., Ltd., and N. Levin. April 21st, 1939. (527871.)

12130. "Magnetic dust cores." Standard Telephones & Cables, Ltd., and S. E. Buckley. April 22nd, 1939. (Addition to 483919.) (527874.)

12139. "Bolted electrical connections." E. F. Emery. April 22nd, 1939. (527930.)

12164. "Electric flash lamps." British Thomson-Houston Co., Ltd. April 23rd, 1938. (527882.)

12177. "Scanning-ray tube target for a television signal reproducing system." Hazeltine Corporation. April 29th, 1938. (527886.)

12178. "Brake magnets for electricity meters." Chamberlain & Hookham, Ltd., S. James and A. J. Wheeler. April 22nd, 1939. (527887.)

12181. "Control of soot blower installations of steam generators." Hopkinsons, Ltd., R. L. Brown and W. B. Dale. April 22nd, 1939. (527889.)

12193. "Cathode-ray tubes comprising electrostatic deflecting means." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 25th, 1938. (527893.)

12225. "Electric signal transmission systems." Electrical Research Products, Inc. April 28th, 1938. (527936.)

12232. "Radio navigation system." M. Wallace. April 26th, 1938. (Addition to 525393.) (527937.)

12260. "Thermionic valves." M. O. Valve Co., Ltd., and T. S. McAulay. April 24th, 1939. (527942.)

12277. "Electric heaters." British Thomson-Houston Co., Ltd. April 26th, 1938. (527948.)

12278. "Electric transformers." British Thomson-Houston Co., Ltd. April 26th, 1938. (527949.)

12325. "Frequency-reducing arrangements." Associated Electric Laboratories, Inc. May 2nd, 1938. (527957.)

12364. "Electro-magnetic charging switches and regulators." R. Bosch Ges. May 27th, 1938. (527963.)

12403. "High-frequency wave transmission systems." Standard Telephones & Cables, Ltd. April 28th, 1938. (527988.)

12414. "Resinous compositions and methods of making the same." British

(*Continued at foot of next page*)

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

Companies' Returns

Statements of Capital

South Metropolitan Electric Light & Power Co., Ltd.—Capital, £1,600,000 in 150,000 7 per cent. cumulative first preference, 100,000 6 per cent. cumulative second preference, 500,000 4 per cent. cumulative third preference and 850,000 ordinary shares of £1 each. Return dated April 11th, 1940 (filed June 26th, 1940). 150,000 7 per cent. first preference, 100,000 6 per cent. second preference, 500,000 4 per cent. third preference and 775,000 ordinary shares taken up. £1,167,132 paid on 144,632 first preference, 100,000 second preference, 500,000 third preference and 422,500 ordinary shares. £357,868 considered as paid on 357,868 shares. Mortgages and charges, £1,500,000.

Reason Manufacturing Co., Ltd.—Capital, £52,500 in 200,000 preference and 10,000 ordinary shares of 5s. Return dated June 28th, 1940. 161,260 preference and 10,000 ordinary shares taken up. £19,664 5s. paid on 78,657 preference shares. £23,150 15s. considered as paid on 82,603 preference and 10,000 ordinary shares. Mortgages and charges, £20,000.

Johnson & Tanner, Ltd.—Capital, £2,500 in 1,000 preference shares of £1 and 30,000 ordinary shares of 1s. Return dated June 5th. 1,000 preference and 25,050 ordinary shares taken up, £1,252 10s. paid on 1,000 preference and 5,050 ordinary shares. £1,000 considered as paid on 20,000 ordinary shares. Mortgages and charges, £653.

Howard Asphalt Troughing Co., Ltd.—Capital, £20,000 in 19,000 ordinary and 1,000 deferred shares of £1 each. Return dated June 24th. 5,007 ordinary and 1,000 deferred shares taken up. £4,007 paid. £2,006 considered as paid. Mortgages and charges, nil.

New Patents (*Continued from page 45*).

Thomson-Houston Co., Ltd. April 27th, 1938. (527993.)

12426. "Electron multiplier tubes." Marconi's Wireless Telegraph Co., Ltd. May 3rd, 1938. (527996.)

12458. "Method of making luminescent substances adhere to glass walls." Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares, Etablissements C. Paz & Silva. March 29th, 1939. (528004.)

12459. "Electric supply system for starting and feeding, under low tension, an electric-discharge tube." Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares, Etablissements Claude Paz & Silva. March 29th, 1939. (528005.)

12519. "Homogenisers." Brush Electrical Engineering Co., Ltd., and K. Senior. April 26th, 1939. (528019.)

12522. "Inductor type alternators." F. Newton. April 26th, 1939. (528020.)

12527. "Thermal switches for controlling electric motors." British Thomson-Houston Co., Ltd. April 28th, 1938. (528022.)

12529. "Telephone systems." Automatic Telephone & Electric Co., Ltd. J. E. T. Parker, and J. B. McCusker. April 26th, 1939. (528023.)

12533. "Manufacture of ferro-magnetic material." Steatit-Magnesia Akt. Ges. April 27th, 1938. (528025.)

Ewell Court Electrical, Ltd.—Capital, £2,000 in 2,000 shares of £1 each. Return dated July 2nd, 1940. 1,510 shares taken up. £10 paid. £1,500 considered as paid. Mortgages and charges, nil.

Herne Bay and District Electricity Supply Co., Ltd.—Capital, £140,000 in £1 shares. Return dated May 24th. 116,006 shares taken up. £96,006 paid. £20,000 considered as paid. Mortgages and charges, £27,000.

Birkdale District Electric Supply Co., Ltd.—Capital, £55,000 in £5 shares. Return dated May 24th. 10,200 shares taken up. £51,000 paid. Mortgages and charges, £25,544 14s. 10d.

Eastern Telegraph Co. (France), Ltd.—Capital, £40,000 in £1 shares. Return dated June 4th. All shares taken up, £40,000 paid. Mortgages and charges, nil.

Electrical Safeguards, Ltd.—Capital £1,000 in £1 shares. Return dated February 27th, 1940 (filed June 4th, 1940). 101 shares taken up. £101 paid. Mortgages and charges, nil.

Mortgages and Charges

Electric Services (G. D. Jones), Ltd.—First mortgage debenture, charged on the company's undertaking and property, including uncalled capital, dated October 29th, 1940, to secure sums not exceeding £350. Holder: W. le Resche Hand, 23, Danford Lane, Solihull, Warwickshire.

North of England Engineering & Electrical Co., Ltd.—Particulars filed of £1,000 debentures, authorised October 10th, 1940, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Milnes Electrical Engineering Co. (Bingley), Ltd.—Mortgage, on all moneys due under a certain contract, dated October 9th, 1940, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Sign Transformer Co., Ltd.—Debenture, charged on the company's undertaking and property, including uncalled capital, dated October 4th, 1940, to secure £500. Holder: H. R. Watson, 192, Copse Hill, Wimbledon, S.W.20.

Albert Mann's Engineering Co., Ltd.—Mortgage debenture, charged on the company's undertaking and property, including uncalled capital, dated October 17th, 1940, to secure £220. Holder: Cornelius Mahoney, 197, Westrow Drive, Barking.

T. Beadle & Co., Ltd.—Satisfaction in full on October 8th, 1940, of mortgage dated May 2nd, 1921, and registered May 7th, 1921. (According to the register of mortgages, the mortgage registered May 7th, 1921, originally secured £1,000.)

Receivers Appointed and Released

Schall & Son, Ltd.—E. Dickinson, 131, Shirley Avenue, Croydon, was appointed receiver and manager on October 9th, 1940, under powers contained in trust deed dated March 20th, 1934. A letter on the file dated October 24th, 1940, confirms a previous letter to the Registrar that the above appointment was never acted on or communicated to the receiver personally, and that a discharge of such receiver dated October 15th, has been signed by the persons making the appointment.

Holdgate & Commin (Electrolier), Ltd.—A. J. Goulden, 55, Brown Street, Manchester, ceased to act as receiver on October 18th, 1940.

Gilberts Electrical, Ltd.—K. M. Scott, 11, Old Jewry, E.C., ceased to act as receiver and manager on October 23rd, 1940.

Winding-up Order

In the Companies' Court on Nov. 4th, Mr. Justice Bennett made an order for the compulsory winding-up of the Great Eastern Electric Co., Ltd. of 73, Houndsditch, London, E.C.

Bankruptcies

T. Maund, 37, Earle Road, Bramhall, Cheshire, lately carrying on business at 80, Wellington Road North, Heaton Norris, Stockport, as an electrical engineer, under the style of Beacon Electrical Co.—This debtor's public examination took place recently at the Court House, Stockport. His unsecured liabilities were stated to be £1,535, of which £1,200 was due for loans, and the balance was in respect of trade debts. The assets were reported to consist of certain book debts, equities in mortgaged properties, and the proceeds from the sale of a motor car. Debtor said that his business declined owing to the building trade having reached saturation point. The examination was closed.

A. E. Carter, electrical engineer, 10, Pages Lane, Muswell Hill, London, N.10.—This debtor applied for his discharge at the London Bankruptcy Court on Oct. 30th before Mr. Registrar Kean. The Official Receiver reported that the debtor failed in June last with liabilities at £510, and his assets had realised £17. The Registrar granted the discharge subject to a suspension of four months.

Private Arrangement

F. R. Skeels, electrical engineer and contractor, 91, Dover Road, Wanstead Park, E.12.—At a recent meeting of the creditors a statement of affairs was submitted showing liabilities of £1,442 against assets estimated at £779, leaving a deficiency of £663. It was decided that the debtor should be requested to execute a deed of assignment in favour of Mr. N. Osborne, of 11-12, Finsbury Square, London, E.C., as trustee, with a committee of inspection.

Reports and Dividends

Murex, Ltd.—Presiding at the recent annual meeting, Mr. G. P. Joseph said that shareholders would appreciate his reasons in not referring to the increased activities of their organisation, other than to assure them that their efforts were being directed to furthering the interests of the country in the present emergency. Referring to the balance sheet, the chairman said that no addition to the obsolescence reserve had been made from the profits of the year under review, but they proposed an addition to the general reserve of the parent company, and the reserve position had been strengthened

(*Continued on page 49*)

STOCKS AND SHARES

TUESDAY EVENING

PLETHORA of money is one of the outstanding features which affect the Stock Exchange markets of today. In spite of the very substantial sums that are going into National War Bonds and other Government forms of borrowing at the present time, a considerable amount of capital is available for investment. Large sums, moreover, will be released towards the end of the month, and these are already seeking investment in directions which will yield a better rate of interest on the money than is afforded by the National issues. Industrial stocks and shares of every description are in demand with a persistency equal to that shown by nightly raiders. Meanwhile, the present holders of shares show no particular inclination to realise their interests. If they do, it is a matter of difficulty to replace the stocks with suitable substitutes.

Dividend Discussions

These may still be early days in which to attempt discussion of dividend possibilities for the year 1940 in connection with the home electricity supply companies; but, in point of fact, efforts are being made to discriminate between those companies that are likely to maintain their previous distributions, and others whose dividends appear liable to reduction. The search for first-rate industrial investments is intensified by the efforts to find such shares by the holders of the Canadian securities that are shortly to be paid off under the latest requisitioning order of the Treasury. Proprietors of the securities required by the Government, are given no option as to whether they should hand over their stocks or not. Under the Order, they are required to sell them to the Treasury at prices fixed by the latter, which prices, by the way, are certainly fair and reasonable.

Five to Five-and-a-half per cent.

Edmundsons Electricity Corporation is expected to maintain the 6 per cent. dividend that was paid both for 1938 and 1939. In 1938, Edmundsons distributed a share bonus of 50 per cent. and the previously-paid dividend of 9 per cent. was accordingly reduced to its equivalent of 6 per cent. on the increased capital. The company and its subsidiaries are doing well, and at 23s. 6d., the current price of the shares, the return on the money is £5 2s. 2d. per cent. Dividends are due in June and December. The two Scottish companies, Clyde Valley and Scottish Power, are also thought likely to maintain their dividends, of 8 per cent., which have been paid for several years past. Scottish Power, at 30s., return £5 6s. 8d. per cent. Clyde Valley are in short supply and this accounts, to some extent, for the relatively high price of the shares—31s. 3d.—at which the yield is £5 2s. 5d. per cent. on the money.

Yorkshire and Lancashire

The Yorkshire Electric Power Co. will probably repeat its usual dividend of 8 per cent. and the Lancashire Electric Power is expected to continue the 7½ per cent. dividend of recent years. In both these cases, a scarcity of stock prevails in the market. The return on Yorkshires, at 30s. 9d., is £5 4s. 1d.; on Lancashires, at 26s. 3d., £5 14s. 3d. per cent. Whether the Metropolitan will be able again to pay 10 per cent., is considered rather uncertain, and this accounts for the price standing at a level that yields 7 per cent. on the basis of a 10 per cent. dividend.

Study of the yield-figures in the price lists will give a clue to market anticipations in regard to the probable dividends for the current year. That is to say, the comparatively high rate of return offered by some of the shares may afford a hint of an impression that the dividends are likely to be reduced.

Sinking Funds and their Effect

A minor source from which capital is becoming available is that which rises from the sinking funds operated by many companies in connection with their issues of debenture stocks. One of these, for instance, is the London Power Co., which annually draws a certain proportion of its 5 per cent. debenture stock and pays off the holders at 100. As usual, there will be stock repaid on this account at the end of the year, probably to the regret of its proprietors who will then be obliged to accept £100 for what is a perfectly safe 5 per cent. investment, and for which it is not easy to find an appropriate substitute. The price of the stock in the market is 100 to 101; and, as the interest is payable on the 1st April and October, the holder who has had his stock drawn for payment on December 31st next, can, if he so desires, buy stock at the present time with comparatively small loss to himself. The chances of having the stock redeemed are increased, naturally, every year by the diminution of the total amount remaining in issue. For this reason, a security standing at a lower price, even though it may give a lesser rate of return than 5 per cent., is likely to be considered preferable by the investor.

Home Rails and Transport

Home railway stocks have been showing a firm front in response to a little buying on behalf of speculative investment, and, also, for the account of people who will have money to invest when they receive the proceeds of the Canadian stocks for which the Government is going to pay on November 26th and after. The fear of physical damage to the roads of the railway companies appears to be thrust into the background by more optimistic expectations of the forthcoming railway dividends. There is, too, a hope that the new agreement to be forged between the Government and the railways, will serve to guarantee the revenue which had already been promised under the existing arrangement. On the strength of this, business is broadening in Home Railway stocks, though it has to be admitted that whereas in pre-war days £5,000 or £10,000 stock would change hands without moving a price, today a matter of £1,000 or £2,000 stock suffices to raise or depress a quotation.

Southern Railway preferred ordinary holds its previous price of 44½. The 5 per cent. preference has risen 4 points to 78½, there being an insistent urge to buy prior-charge issues, of which there is, as already mentioned, but a meagre amount available. London Passenger Transport prior charge stocks are steady. The "C" stock shows an improvement at 27 middle: business has been done at 28. Tillings are changing hands at a shade over 40s. British Electric Traction deferred stock has risen 25, to 750.

Miscellaneous Matters

The rise to 40s. in Thomas Tilling shares has led to inquiry, and to a gain of 3s. 9d., in Tilling & British Automobile, which are now up to 44s. 6d. Lancashire Transport ordinary, at 35s., are 5s. to the good. Bristol Trams at 37s. 6d. show ⅛ rise. In the equipment and manufacturing group, General Electrics have been a good spot, with an ⅛ rise to 75s. The 6½ per cent. preference have strengthened to 30s. Provincial demand for Ensign Lamps found very few shares on offer and the price advanced to 15s. British Aluminium ordinary, at 40s., Callenders, at 57s. 6d., Telegraph Construction, at 32s. 6d. and Westinghouse Brake, at 33s. 9d., are amongst those which have gained 1/16. Speculation has been trying to buy Brush ordinary, the price of which has risen to 3s. 9d. Murex, on the recently published figures set out here, are 3s. 9d. harder at 76s. 3d. A few falls of 1/16 included Hall Telephone, at 10s., J. Lucas, 47s. 6d. and Tube Investments, 82s. 6d. Engineering shares are in demand. Babcocks, at 37s. 6d., have gained 1s. 9d., and in the Iron and Steel list, Vickers are a good spot at 14s. bid. Revo hold their price of 17s. 6d., declaration of an interim dividend of 5 per cent. giving rise to the hope of a final of similar amount. Cable & Wireless stocks are better, the ordinary are 51, being 2 points up.

Debenture Stocks on Offer

Of the home electricity supply companies' debenture stocks there is not a great deal on offer, but £15,000 North Metropolitan Power Station 3½ per cent. second mortgage debenture stock, Series "B," 1965, can be obtained at 91½, March and September interest, to give £3 16s. 6d. per cent. on the money. With allowance for redemption at 100 in 1965, the return is brought up to £4 1s. per cent. South Metropolitan 4½ per cent. debenture stock, at 105½, gives 4¼ per cent. outright and £3 18s. 6d. per cent. assuming repayment at 100 in 1955. Of this there is £10,000 available in the market. A similar amount of London Power 4 per cent. debenture stock can be bought at 101½ to give £3 18s. 9d. per cent. This is redeemable at 100 in 1972, or after 1951 at the same price; if redemption takes place in 1952, the yield would be £3 16s. 9d. per cent. Interest payments are due on the first of January and July. A small amount of Midland Counties 3½ per cent. debenture stock at 93, redeemable in 1962, pays 3¾ per cent. and Mersey Power 3½ per cent. debenture, of which £8,000 is in the market, can be obtained at the same price. The Mersey Power debenture is redeemable in 1975.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price Nov. 11	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	65/6	36/6	15	15	38/9	..	—
British Power and Light	30/–	20/–	7	7	24/–	+6d.	5 16 8
City of London	28/–	20/–	7½	7½	20/9	..	—
Clyde Valley	38/6	24/–	8	8	31/3	..	5 2 5
County of London	43/3	21/–	10½	10½	27/–	+9d.	7 15 6
Edmundson's:							
7% Pref.	32/–	24/3	7	7	28/3	..	4 19 1
Ord.	27/6	18/6	9	6	23/6	+1/6	5 2 2
Elec. Dis. Yorkshire	40/3	32/–	9	9	32/6	..	5 10 9
Elec. Fin. and Securities	42/–	34/6	12½	12½	38/9	..	6 9 0
Elec. Supply Corporation	48/–	39/–	12	11½	37/–	..	6 4 4
Isle of Thanet	16/–	5/6	4	4	6/–	..	—
Lancs Light and Power	33/–	21/6	7½	7½	26/3	+⅛	5 14 3
Llanelly Elec.	21/–	17/–	5½	5½	17/–	−6d.	6 9 5
Lond. Assoc. Electric	21/–	12/6	7	5½	13/3	..	—
London Electric	35/–	19/–	8	7	20/–	..	7 0 0
London Power Deb. Red.	105½	100	5	5	100½	..	4 19 6
Metropolitan	41/6	22/6	12	10	28/9	+⅛	6 19 2
Midland Counties	39/–	23/3	8	8	29/6	+9d.	5 8 5
Mid. Elec. Power	40/–	29/6	9	9	32/–	..	5 12 6
Newcastle Elec.	29/9	22/6	7	7	22/6	..	6 7 3
North Eastern Elec.:							
Ordinary	31/6	16/6	7	7	22/6	..	6 4 5
7% Pref.	32/6	25/6	7	7	27/6	..	5 1 10
Northampton	44/–	38/–	10	10	38/9	..	5 3 3
Notting Hill 6% Pref. (£10)	10⅜	9	6	6	9	..	—
Northmet Power:							
Ordinary	42/3	22/6	10	10	27/6	..	—
6% Pref.	29/–	23/–	6	6	26/–	..	4 12 4
Richmond Elec.	24/6	18/–	7	6	18/9	..	—
Scottish Power	38/–	24/–	8	8	30/–	+⅛	5 6 8
Southern Areas	21/3	12/9	5	5	13/9	+6d.	7 5 6
South London	23/3	20/–	7	7	20/–	..	7 0 0
West Devon	20/–	17/6	5	5	20/–	..	5 0 0
West Glos.	22/–	15/–	2½	4½	16/3	..	5 10 10
Yorkshire Elec.	40/–	23/6	8	8	30/9	+9d.	5 4 1
Overseas Electricity Companies							
Atlas Elec.	4/–	1/3	Nil	Nil	1/9	..	—
Calcutta Elec.	37/–	22/6	10*	8*	30/6	..	5 5 0
Cawnpore Elec.	30/–	24/–	10	10	25/–	..	8 0 0
East African Power	25/6	19/6	7	7	20/–	..	7 0 0
Jerusalem Elec.	24/–	15/–	7	7	16/3	..	8 12 4
Kalgoorlie (10/–)	12/6	9/6	7½	7½	11/–	..	6 16 5
Madras	26/9	21/6	8*	6*	25/–	..	4 16 1
Montreal Power	35½	30	1½	1½	32	..	—
Palestine Elec. "A"	25/–	10/–	5*	Nil	11/3	..	—
Perak Hydro-electric	20/3	13/–	2½	6	15/–	..	8 0 0
Shawinigan Power	27½	19	83cts.	90cts.	20	..	—
Tokyo Elec. 6%	69	52	6	6	30	..	20 0 0
Victoria Falls Power	75/9	56/–	15	15	66/3	+¼	4 10 8
Whiteball Investments Pref.	17/9	8/–	7½	7½	10/–	..	15 0 0
Public Boards							
Central Electricity:							
1950–70	110½	104	5	5	105½	..	4 14 8
1955–75	112½	106	5	5	107½	..	4 13 0
1951–73	107½	102	4½	4½	105½	..	4 7 0
1963–93	96½	90	3½	3½	91	+½	3 17 0
London Elec. Trans. Ltd.	92	87½	2½	2½	95	..	2 13 9
London & Home Counties							
1955–75	113½	105	4½	4½	105½	..	4 5 4
Lond. Passenger Transport:							
A	116	104	4½	4½	106	..	4 5 0
B	116	102½	5	5	104½	..	4 15 8
C	65½	25	1½	1½	27	..	5 11 2
West Midland Joint Elec.							
1948–68	106½	103	5	5	105½	..	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	230	176	9	9	200	..	4 10 0
Anglo-Am. Tel.:							
Pref.	107	85	6	6	94	..	6 7 8
Def.	23¾	18	1½	1½	22½	..	6 13 4
Anglo-Portuguese	22/6	10/–	8	8	15/–	..	10 13 4
Cable & Wireless:							
5½% Pref.	99¾	66	4½	5½	85	+1	6 9 5
Ord.	65	27	4	4	51	+2	7 16 10
Income	99¾	93	..	..	98½	..	4 1 3
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/6	..	—
Globe Tel. & Tel.:							
Ord.	32/6	21/6	7½*	6*	25/–	..	4 16 0
Pref.	27/9	22/6	6	6	23/9	..	5 1 1
Great Northern Tel. (£10)	20	11	20	20	12½	..	—
Inter. Tel. & Tel.	5½	2½	Nil	Nil	3½	..	—
Marconi-Marine	30/–	18/3	10	7½	20/–	..	7 10 0
Oriental Telephone Ord.	2⅞	45/–	12*	11½*	2¾	..	4 16 10
Telephone Props.	15/–	11/–	5	6	12/6	..	9 12 0
Telephone Rentals (5/–)	9/6	5/3	10	10	6/3	..	8 0 0
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	4/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	11½	2	Nil	Nil	7	..	—
British Electric Traction:							
Def. Ord.	830	400	5	45	750	+25	6 4 4
Pref. Ord.	169	130	8	8	140	..	5 14 3
Bristol Trams	48/6	32/6	10	8*	37/6	+½	—
Brazil Traction	12½	5½	$1	50c.	5½	..	—
Calcutta Trams	24/–	16/3	8	5½	19/–	..	5 15 9
Cape Elec. Trams	18/6	16/–	5	5	17/–	..	5 17 8
Lancs Transport	35/–	27/6	10	10	35/–	+5/–	5 14 3
Mexican Light:							
1st Bonds	36	25	5	5	35	..	—
Rio 5% Bonds	95	74	5	5	90	..	5 11 3
Southern Rly.:							
5% Prefd.	79	35	5	5	44½	+1	11 7 4
5% Pref.	104½	59	5	5	78½	+4	6 7 5
T. Tilling	45/9	29/–	10	10	40/–	..	5 0 0
Tilling & B.A.	47/6	41/9	9*	8*	44/6	+⅛	—
West Riding	35/–	25/–	10	10	33/–	+2/–	6 1 3
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/–	15	Nil	14/–	..	—
Assoc. Elec.:							
Ord.	43/3	26/6	10	10	36/3	+4/3	5 10 4
Pref.	36/6	32/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	37/6	..	6 13 4
Babcock & Wilcox	50/–	28/6	10	11	37/6	+1/9	5 17 4
British Aluminium Ord.	56/–	29/–	12½	12½	40/–	+¼	—
British Insulated Ord.	92/6	67/–	20	20	77/6	..	5 6 8
British Thermostat (5/–)	14/9	6/6	18½	18½	9/6	..	9 14 8
British Vacuum Cleaner (5/–)	12/–	4/9	40	12½	6/3	..	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	3/9	+⅛	—
Callender's	69/–	46/–	15	15	57/6	+⅛	5 4 4
Chloride Elec. Storage	72/6	55/–	15	15	2½	..	5 4 4
Consolidated Signal	72/6	59/–	36½	17	60/–	..	5 13 4
Crabtree (10/–)	24/9	17/6	17½	17½	20/–	..	8 15 0
Crompton Parkinson:							
Ord. (5/–)	20/–	12/–	30	20	15/–	..	6 13 4
E. K. Cole (5/–)	5/–	2/6	10	Nil	4/–	..	—
Elec. & Musical Industries (10/–)	10/3	4/3	5	Nil	8/–	..	—
Electric Construction	36/3	27/6	13½	10	27/6	..	7 5 6
Enfield Cable Ord.	56/–	40/6	25	16½	45/–	..	7 5 5
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	33/9	16/6	10	10	27/6	..	7 5 4
Ensign Lamps (5/–)	15/3	12/6	25	25	15/–	+⅛	8 6 8
Ericsson Tel. (5/–)	39/3	23/–	25*	25*	25/–	..	—
Ever Ready (5/–)	28/3	16/6	30	40	25/6	..	7 16 10
Falk Stadelmann	18/3	12/6	6	7	13/9	..	10 3 8
Ferranti Pref.	25/–	22/–	7	7	23/9	..	5 18 0
G.E.C.:							
Pref.	32/6	26/–	6½	6½	30/–	+⅛	4 6 8
Ord.	83/3	53/–	20	20	75/–	+⅛	5 6 8
Greenwood & Batley	25/6	20/–	15	15	20/–	..	13 0 0
Hall Telephone (10/–)	18/6	8/9	15	10	10/–	−⅛	10 0 0
Henley's (5/–)	21/6	12/6	20	20	17/6	..	5 14 3
4½% Pref.	21/3	20/6	4½	4½	21/3	..	4 4 8
Hopkinsons	46/9	32/6	12½	15	36/3	..	8 5 6
India-Rubber Pref.	21/–	19/6	5½	5½	20/–	..	5 10 0
Intl. Combustion	121/3	70/–	32½	32½	3⅜	..	8 13 4
J. Lucas	60/6	40/–	15	15	47/6	−⅛	6 6 4
Johnson & Phillips	50/9	32/6	12½	15	42/6	..	7 1 2
Lancashire Dynamo	59/9	47/6	25	20	47/6	..	8 8 5
Laurence Scott (5/–)	11/–	6/–	15	15	8/–	+1/–	9 7 6
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	46/6	30/–	13½	10	33/9	..	5 18 6
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	86/9	52/6	20	20	76/3	+⅛	5 5 0
Pye Deferred (5/–)	9/–	6/9	25	25	8/9	..	14 5 8
Revo (10/–)	20/9	11/6	17½	5	17/6	..	2 17 6
Reyrolle	60/6	41/–	12½	12½	45/–	..	5 11 2
Siemens Ord.	23/9	15/6	7½	7½	16/3	..	9 4 8
Strand Elec. (5/–)	2/3	9d.	10	4	1/3	..	16 0 0
S. Smith (1/–)	8/–	3/6	37½	50	7/6	..	6 13 4
Switchgear & Cowans (5/–)	11/9	5/6	20	10	7/–	..	7 2 10
Telegraph Condenser (10/–)	8/9	6/3	5	..	7/6	..	—
Telegraph Construction	42/6	29/–	10	10	32/6	+⅛	6 3 0
Telephone Mfg. (5/–)	9/–	5/–	9	9	6/–	+3d.	7 10 0
Tube Investments	96/9	59/–	23½	23½	82/6	−⅛	5 14 0
Vactric (5/–)	3/6	2/–	4	Nil	2/3	..	—
Vickers (10/–)	22/–	9/6	10	10	14/–	+6d.	7 2 10
Ward & Goldstone (5/–)	19/9	12/6	20	20	12/6	..	8 0 0
Westinghouse Brake	46/–	30/6	17½	10	33/9	+⅛	5 18 6
Walsall Conduits (4/–)	26/6	17/6	55	55	23/9	..	9 5 0
West, Allen (5/–)	7/–	3/–	10	7½	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Birkenhead.—November 18th. Electricity Department. E.h.v. cable, l.v. cable (paper insulated), l.v. cable (rubber insulated), meters & general stores for six months from January 1st, 1941. (See this issue.)

Ebbw Vale.—November 29th. Electricity Department. H.v. and pilot cables, substation switchgear and transformers. (November 8th.)

Middlesbrough.—Electrical installations for 110 surface shelters; Cecil Gorman, Town Hall, Middlesbrough.

New Zealand. — WELLINGTON. — Public Works Department. January 14th. Two 3,000-kVA, 11-kV, three-phase, 50-cycle outdoor-type voltage regulating transformers and control equipment. (T.22238/40.)*

South Africa.—PRETORIA.—Union Tender & Supplies Board. December 12th. Electric light fittings for G.P.O. (T.22426/40.)*

December 4th. Laundry equipment. (T. 21987/40.)*

January 4th. Plant at gasworks, Cottesloe: (a) One 200-kW rotary convertor and associated equipment. Alternatively (b) one 200-kW mercury arc rectifier or (c) two 100-kW mercury arc rectifiers. (d) Equipment for spare power circuit frame. (T. 22424/40.)*

Wolverhampton.—December 3rd. West Midlands Joint Electricity Authority. High- and low-voltage AC cables and low-voltage DC cables. (November 8th.)

Orders Placed

Durham.—County Education Committee. Accepted. Electrical re-wiring of the Rowlands Gill School premises (£138).—T. W. Atkinson.

County Council.—Accepted. Electrical fittings for the new West Hartlepool Police Station (£65).—Sun Electrical Co., Newcastle-on-Tyne.

Ilford.—ELECTRICITY COMMITTEE. Accepted. Switchboard (£4,980).—Crompton Parkinson.

Keighley.—Parks Committee. Accepted. Wiring the Mansion House in Victoria Park (£85).—P. Lee.

Notts.—County Council Assistance Committee. Accepted. Fire alarm installation at East Retford institution (£98).—E. A. C. Husbands.

Stoke-on-Trent. — HOUSING COMMITTEE. Fresh tender accepted. Wiring 115 houses (£1,076).—Hobson & Scott.

ELECTRICITY COMMITTEE. Accepted. Replating battery (£324).—Chloride Electrical Storage Co., Ltd.

Swansea.—Electricity Committee.—Accepted. Electrically driven feed pumps (£10,206).—Mather & Platt. Stand-by steam pump (£1,482).—G. & J. Weir. Control gear (£4,585).—Watford Electric & Manufacturing Co.

Worthing.—EDUCATION COMMITTEE.—Accepted. Heating and lighting installation at school shelters.—Phillips & Dart, Ltd. (£647), H. J. Galliers (£274) and F. Sandell & Sons, Ltd. (£144).

York.—Health Committee. Accepted. Generating set for general hospital (£895).—Belliss & Morcom.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ayrshire.—Air-raid shelters, to cost £20,000; architect, County Council, Ayr.

Bangor (North Wales).—Completion of hall of residence for male students; P. E. Thomas, architect, 10, Cathedral Road, Cardiff.

Banstead.—Public surface shelters (50 persons each), for U.D.C.; F. H. Wiltshire, clerk, The Council House, Brighton Road, Banstead, Surrey.

Basingstoke.—Public shelters (700 persons); borough engineer, Municipal Buildings, Basingstoke.

Berwick.—Shelters, Highfield Estate; borough engineer.

Birmingham.—Waste utilisation factory; White & Young, Ltd., Frederick Road, Selly Oak, Birmingham.

Blackpool.—Club room; H. A. Thomas, architect.

Shelters (7,000); borough engineer.

Communal feeding centre; borough engineer.

Brighouse.—Communal shelters (100); Gibson Bros., builders, Lillands Avenue, Brighouse.

Chester.—Additional public shelters; contracts let to H. A. Clegg & Son, Ltd., City Road, Chester; E. J. B. Gould, Cromwell Road, Ellesmere Port; and A. H. Moorcroft, Chrisleton, Chester.

Adaptation of room, Castle Street, as curator's workroom, with heating and lighting work; borough engineer, Municipal Offices, Town Hall, Chester.

Chesterfield.—Public shelter for 200; W. S. Wilson, borough surveyor, Town Hall.

Coventry.—Extensions to Police Station, F. Hickman & Son, builders, Caxton Street; Market Harborough.

Hostel; V. N. Brailsford, secretary, Chamber of Commerce.

Houses on Stivichall Hall Estate; D. E. E. Gibson, city architect, 1A, Warwick Row.

Church Hall extensions, Link Road; St. Francis Church trustees.

Cumberland.—Public shelters at Penrith, Cockermouth and Keswick (£6,400); J. H. Haughan, county architect, 4, Alfred Street North, Carlisle.

Derbyshire.—School shelters (£38,000); county architect, St. Mary's Gate, Derby.

Dewsbury.—Dining hall, &c., at Thornhill Senior School; M. H. Forward, borough architect, Town Hall, Dewsbury.

Droitwich.—Bus station; borough surveyor, Friar Street, Droitwich.

Dukinfield.—Completion of 34 houses, Astley Mill site; borough engineer, Town Hall, Dukinfield, Ashton.

Financial Section *(Concluded from page 46).*

further by the creation of a general reserve by Murex Welding Processes, Ltd. If the proposals were given effect to, the reserves carried in the parent company and its wholly owned subsidiaries, including the carry-forward and the obsolescence reserve, would amount to £738,063.

Compania Hispano Americana de Electricidad (Chade), Barcelona, reports a net profit for 1939 of 25,109,721 gold pesetas, as compared with 29,252,958 gold pesetas for 1938. The profits, after payment of interim dividends at the rate of 4½ pesetas per 100 pesetas, is transferred to a special reserve for release of capital to be used for distribution of a scrip bonus on the shares. The balance carried forward is 12,294,355 gold pesetas (against 8,902,714 gold pesetas brought in).

The Electrolux Corporation (U.S.A.) reports a net profit for the nine months to September 30th, after providing for tax, of $1,094,675, as compared with $1,113,000 for the corresponding period of 1939, which is equivalent to 88 cents per share (against 90 cents). The decrease is accounted for by increased taxes.

The Pernambuco Tramways & Power Co. reports that after providing for interest on the 5 per cent. first debentures and interest to the extent of 4 per cent. on the 8 per cent. demand note the balance of revenue for 1939, before exchange adjustments, amounted to £19,291. For 1938 it was £13,293, but this was exclusive of any interest on the 8 per cent. demand obligation of the company, as all interest was waived by the creditor in 1938. Exchange loss on working capital amounted to £3,685 and £252 has been written off securities, etc., leaving a net balance of £15,353. This reduces the deficit at December 31st to £113,429.

Ensign Lamps, Ltd., are paying a final dividend of 15 per cent., maintaining the distribution for the year at 25 per cent.

Heenan & Froude, Ltd., report a net profit for the year of £50,405, as compared with £53,965 for the preceding year. The final dividend is 5 per cent., making 10 per cent., less tax, for the year (same), and the cash bonus of 5 per cent., less tax, is also maintained.

The Hankow Light & Power Co. reports a loss for the year to March 31st, after providing £4,000 for depreciation, of £7,784, as compared with £6,560 in the preceding year. The balance carried forward is £4,763 (against £12,457 brought in). The report states that sales of electricity decreased by 765,204 kWh to 5,446,539 kWh, and there was an increase in the number of consumers of 170 to 4,175.

Yarrow & Co., Ltd., report a profit of £67,137 for 1939-40—an increase of £1,496. The dividend is reduced from 20 to 17½ per cent. tax free and £35,000 goes to general reserve.

The Revo Electric Co., Ltd., is paying an interim ordinary dividend of 5 per cent. as last year.

Guest, Keen & Nettlefolds, Ltd., have declared an interim dividend of 2½ per cent., free of tax (same).

Durham.—Police superintendent's house at Houghton-le-Spring for County Council (£1,700); John Robinson, builder, Houghton-le-Spring.

Public shelters (£14,272); county surveyor, 43, Old Elvet, Durham.

Maternity and child welfare premises (£600); county surveyor.

Eire.—DUBLIN.—Houses (455), Crumlin North housing area; H. G. Simms, housing architect, 5, Wellington Quay, Dublin.

KILDARE.—Water supply scheme for Monasterevan, including well, pump-house, reservoir, &c., for Board of Health; N. O'Dwyer, engineer, 6, Burlington Road, Dublin.

NORTH CRUMLIN.—Erection of new national schools; G. P. Fagan, secretary, Office of Public Works, Dublin.

Enfield.—Shelters (£15,476); Townsend & Collins, Ltd.

Finchley.—Factory extensions; Beacon Estates, Ltd.

Garforth (Yorks).—Fifty-three shelters for U.D.C.; B. J. Cornelius, surveyor.

Gateshead-on-Tyne.—Air-raid shelters; J. Sutton & Son, Prospect Works, Tinn Street, Gateshead-on-Tyne; W. C. Leech, 2, Clayton Street, Newcastle-on-Tyne; and C. B. Smith, contractor, Eighton Banks, Wrekenton, near Gateshead.

Glasgow.—Dining-room, air-raid shelter, &c., for David MacBrayne, Ltd.; plans by Lambhill Ironworks, Ltd., Lambhill.

Conversion of tunnel into shelter to accommodate 700 persons; city engineer.

Gloucestershire.—Shelters at Cheltenham (£2,500); county architect, Shire Hall, Gloucester.

Great Yarmouth.—Communal air-raid shelters; F. Conway, town clerk, Town Hall, Great Yarmouth.

Hendon.—Paint spray shop; Boosey & Hawkes, Ltd.

Day nursery, Watling Estate; borough engineer, Town Hall, N.W.4.

Hinckley.—Works additions, for Barwell and District Co-operative Society, Ltd.; Architects' Department, C.W.S., Ltd., 1, Balloon Street, Manchester.

Hull.—Two rescue, decontamination and repair depots; city engineer, Guildhall, Hull.

Keighley.—Canteen and rest room; J. P. Heaton & Co.

Booster house for Council; A. Boothman, waterworks engineer, Devonshire Street, Keighley.

Lancashire.—Shelters at schools (£143,000); S. Wilkinson, county architect, County Offices, Preston.

Pumping station, Altcar (£3,000); county engineer.

London.—GREENWICH.—Brick and concrete shelters; C. H. Jennings, borough engineer, Town Hall, Greenwich, S.E.10.

Macclesfield.—Conversion of Prestbury Hall; borough engineer.

Manchester.—Extensions to cold stores for Markets Committee; G. Noel Hill, city architect.

Melksham.—Shelters (400 persons) for U.D.C.; Surveyor's Office, Town Hall, Melksham.

Morpeth (Northumberland).—Air-raid shelters at the County Children's Homes; W. W. Tasker, county architect, Mitford Road School, Morpeth.

Newcastle (Staffs).—Public shelters; A. Cotton, borough surveyor, Municipal Buildings.

Extensions to Vulcan Foundry; Billington & Newton, Ltd., Longport.

Northallerton (Yorks).—Air-raid shelters in rural and urban areas; R. Sawtell, County Hall, Northallerton, Yorks.

Runcorn.—Estate development; North Western Estates Development, Ltd., 17, Mill Lane, West Derby, Liverpool.

South Shields.—School shelters (£18,094); A. G. Richardson, acting borough engineer.

Stafford.—Houses (68), Silkmore estate; J. F. Amery, chairman of Housing Committee.

Stirlingshire.—Completion of school at Kilsyth (£10,400); county architect, Viewforth, Stirling.

Stockport.—Junior and infants' school, Broadstone Hall Road, South Reddish, for E.C. (£10,826); Thomas Davies & Son (Contractors), Ltd., Stockport.

Stokesley.—Shelters at Ormesby, Seamer, and Hilton for R.D.C.; surveyor, Council Offices, High Street, Stokesley.

Warminster.—Borehole for U.D.C.; Lemon & Blizard, engineers, Lansdowne House, Castle Lane, Southampton.

Warwickshire.—Shelters for infants at Rugby, Coventry, Solihull, &c. (£70,000); A. C. Bunch, county architect, Shirehall, Warwick.

IN THE COURTS

Damages for Loss of Profit

IN the King's Bench Division recently Mr. Justice Atkinson concluded the hearing of an action by Mr. Halm Wolifson, of Lawers Road, Glasgow, against the London Armoury Co., Ltd., of Ryder Street, Westminster, to recover damages in respect of the non-delivery of torch batteries.

Plaintiff is a general dealer and his case was that he ordered from the defendants in November and December last year 350 gross of Winchester torch batteries for delivery about the middle of December. This was extended to the early part of January this year. The batteries were not delivered on or about the due date and plaintiff now claimed £187 as loss of profit on orders for re-sale which he was unable to execute.

Defendants admitted non-delivery, but pleaded that the date of delivery was not the essence of the contract, and relied on a circular to plaintiff setting out their terms of business, and disclosing that the batteries were imported from America and that the date of delivery was subject to the arrival of the steamer.

His Lordship, in giving judgment, said the defendants were sole importers of Winchester batteries. They offered, subject to cash with order and arrival of steamer, batteries to the plaintiff for delivery in mid-December. His Lordship was satisfied that plaintiff was told that the steamer would arrive in December. Upon that plaintiff gave certain orders, with two cheques. Then plaintiff was told that the ship had arrived and that the goods would be delivered early in January. That was the relevant part of the contract. No goods were delivered until January 18th, when certain cases of batteries arrived. Plaintiff wrote asking for the delivery of the remainder of the batteries. Defendants pleaded war conditions for the delay, but his Lordship thought that the letter was merely putting the plaintiff off as he was promised the goods definitely in December. He thought plaintiff had acted reasonably by waiting till late January before closing the contract. He gave judgment for plaintiff for £187 damages and for the return of the money plaintiff had paid, £593, with costs.

Electric Torch Contract

In another case recently in the King's Bench Division, Mr. Justice Hallitt entered judgment for the defendants with costs in an action for damages brought by Davies and Dywien, Ltd., of Berners Street, W, against Alfred Franks and Bartlett, Ltd., of Hatton Garden, E.C., over a contract for the supply of electric torches.

Plaintiffs' claim was that the defendants had failed to carry out a contract of January, 1940, for the supply of 5,000 electric torches at 4s. a dozen, with the result that they had suffered a loss of profit amounting to £122.

His Lordship, in giving judgment, said he was satisfied beyond a shadow of doubt that the torches were wanted by the middle of January and that plaintiffs were led to believe that they would get them. But that did not conclude the case. There was a question of the contract itself. Plaintiffs thought they had a binding contract, but they had not. On the face of the contract were the words "No obligation." The plaintiffs did not read the contract with the utmost care or they would have realised that there was no binding contract.

Illegal Re-connection of Supply

At Feltham (Middlesex) Police Court recently Mrs. E. Christie (or Turner) was fined £2 on summonses for laying, or causing to be laid, an electric line to connect with an electric line belonging to the Egham & Staines Electricity Co. and stealing electricity valued at £1. It was stated in evidence that the supply to the defendants' premises had been disconnected but a meter reader found that the meter had been reconnected and tampered with. The defendant admitted that she had removed the front of the meter and used the same coin over and over again. A police witness said that there had been previous trouble with the family over electricity supply at other premises and that was probably why the defendant gave another name.

The North Lincolnshire & Howdenshire Electricity Co. recently summoned Albert Woodall, Newport, for laying an electric line to communicate with a line belonging to the company and of consuming electricity the property of the company.

Defendant did not appear and the Clerk of the Howden Court said that the first charge would be proceeded with and the defendant would be arrested on the other charge which was for an indictable offence.

Evidence for the prosecution was to the effect that defendant's supply had been cut off for non-payment of an account and the meter was removed. Later an employee of the company found that the cut-out had been unsealed and a piece of wire, apparently a hairpin, had been inserted as a fuse, and the "tails" from the consumer's switch had been connected up.

A fine of £2, with £4 costs, was imposed. The company agreed to withdraw the second charge.

Power Station Photographer Fined

A fine of £2 was imposed by the Tunbridge Wells magistrates on an employee at the Corporation Electricity Works for taking photographs of the works. He pleaded that he was merely adding to a collection of photographs of local interest. The Bench accepted the defendant's assurance that he had no ulterior motive in taking the photographs.